NEAR-BOTTOM AND PELAGIC GAMMARIDEAN AMPHIPODS IN THE WESTERN INDIAN OCEAN

by

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With 10 figs and 2 tables

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ABSTRACT

Between October 1988 and February 1989, a collection of pelagic and benthopelagic gammarids was taken during the seventeenth cruise of R/V *Vityaz* in the tropical (Seamount Error, Mozambique Channel and Saya de Malha Bank) and subtropical (Walters Shoal) regions of the Western Indian Ocean. A total of 2 362 specimens of 34 gammaridean species were found, four of which (*Amaryllis maculata*, *Scopelocheiropsis sublitoralis*, *Ichnopus walkeri* and *Regalia oculata*) are described as new to science. Comparison of the near-bottom and pelagic samples permitted detection of a group of animals mainly confined to the near-bottom water. A key to lysianassoid amphipods of the genus *Trischizostoma* is given.

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INTRODUCTION

Amphipods form an important element of marine pelagic communities. They inhabit the surface and deep waters of the ocean at all latitudes from the equator to the polar areas. They do not usually form dense populations, but their diversity and the diversity of their life-forms can be high. All amphipods are of benthic origin, but representatives of their different suborders have radiated into pelagic biotopes to differing extents. Unlike the hyperiids, which have become completely pelagic, and the caprellids and ingolphyellids, which have practically no pelagic representatives, some Gammaridea have penetrated into this biotope.

The overwhelming majority of marine gammarids are benthic epifaunal species. However, only a few benthic gammarideans (mainly inhabitants of secluded biotopes, e.g. wood-borers, some symbionts of benthic animals or highly specialized phytal animals) never leave the sea floor. The majority of benthic gammarideans, representing the most diverse life-forms, enter the pelagial some way or other. All stages of expansion into pelagic waters may be traced among them. Some may rise briefly into the near-bottom layer, some make regular migrations into the meroplankton, others may have a long pelagic life without losing all connection with the bottom and, ultimately there are those with a purely pelagic way of life (Vinogradov 1992, 1995). Less than 4 per cent of marine gammaridean species are in this final category: about 100 species of 50 genera, almost all of them belonging to families which also have benthic representatives.

Usually it is the purely pelagic gammarideans that are captured by samplers operating at a considerable distance from the bottom. Other gammarideans from the near-bottom layers are difficult to catch and therefore are poorly represented in collections. It is clearly necessary to carry out near-bottom trawlings as well as pelagic ones in order to obtain a complete picture of a pelagic gammaridean's taxocene. However, near-bottom trawling is fraught with considerable technical difficulties, and consequently the ocean's near-bottom layers have been studied to a considerably lesser extent than purely pelagic or benthic communities. This is certainly true of the Indian Ocean, where the purely pelagic gammaridean fauna has been investigated in detail by past expeditions (of the R/V *Dana*, *Siboga*, *Vityaz* (old)[1] and others). The near-bottom fauna is known to a much lesser extent.

In 1974, during the seventeenth cruise of the Russian R/V *Akademik Kurchatov* to Peruvian coasts, hauls in the near-bottom layer were successfully carried out for the first time using an Isaacs-Kidd midwater trawl with a pressure vibration transducer, the signal of which was transmitted through the cable rope to the frequency meter mounted on the vessel. The transducer reading permitted continuous information on the precise depth of the trawl, and simultaneous measurement of bottom depth with the echosounder permitted deployment of the trawl in the immediate proximity of the bottom. In 1987 this method was used extensively during the eighteenth cruise of R/V *Professor Stockman* to the

1 'Old' *Vityaz,* historically the third Russian research vessel bearing this name, operated between 1949 and 1979. Expeditions of the 'new' *Vityaz* (sometimes incorrectly mentioned in articles as *Vityaz-IV* or *Vityaz-II*) began in 1981.

Pacific submerged ridges, Nazka and Sala-y-Gomez (Rudjakov & Zaikin 1990). That cruise, in particular, gathered a great deal of near-bottom gammaridean material from this region (Vinogradov 1990*b*).

MATERIALS AND METHODS

Between October 1988 and February 1989, analogous works were carried out during the seventeenth cruise of R/V *Vityaz* (new) in the tropical (Seamount Error Mountain (EM), Mozambique Channel (MC) and Saya de Malha Bank (SdM)) and subtropical (Walters Shoal (W)) regions of the Western Indian Ocean[2]. The specimens of pelagic and benthopelagic gammarideans collected by this expedition are the basis of the present work.

Animals were collected with the following apparatus:

1. Samyshev-Aseev modification of the Isaacs-Kidd midwater trawl (IKSAMT) with transducer (see above). Trawl mouth area was 5.5 m^2, the net was 25 m long and made completely out of 5 mm mesh, a sieve frame (1.3 mm mesh, 5 m length) was fitted at the cod-end. Two types of haul were performed: near-bottom trawling at distances of 10–30 m from the bottom (NBT) and pelagic trawling far from the bottom (PT). In all, 28 hauls were carried out in tropical regions and 24 on the Walters Shoal, yielding 1 788 and 502 gammarideans, respectively.

2. Towed underwater apparatus 'Sound', or 'Zvuk' in the Russian language (TUA 'Sound') (Biryukov *et al.* 1990). For plankton studies the construction of the apparatus was modified by the addition of a sampler consisting of two nets with mouth area 0.12 m^2 and mesh size 0.178 mm. The nets were opened and closed successively using the Tucker principle. Control signals for operation of the release gear are applied autonomously at each of the locks. Constancy of distance from the bottom was maintained by the winch operator using TV images during tows near the bottom, and by the apparatus' own echo-sounder in other cases. Hauls of 30 to 60 minutes duration were made at distances of 2 m and 30 m from the bottom (mfb) at each station. In all, 35 stations were sampled with the TUA (15 on the Walters Shoal) from which 61 gammarideans were taken (Note: a preliminary list of these species was published by Vinogradov (1990*a*). Here it is made more precise and given in the final variant (Table 1)).

3. Big Juday plankton net (BDN 37/50) with mouth area 0.1 m^2 and mesh size 0.18 mm

4. Oceanic model of Juday plankton net (ODN 80/113) with mouth area 0.5 m^2 and mesh size 0.18 mm.

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2 One can find detailed descriptions of the Walters Shoal and zoogeographical analysis of its position in Collete & Parin (1991).

Standard catching layers during stations with the Juday nets were 1 000–500, 500–250, 250–100, 100–50 and 50–0 m from the surface. If ocean depth at the point was less than 1 000 m, the lower limit of the deepest haul was selected at a distance of 50 m from the bottom. The Juday net hauls were usually accompanied by hauls with the TUA 'Sound'. In this case 'Sound' works received the next station number (for example, st. 2648–ODN and st. 2649–TUA), but catches were carried out in the same point. Only 11 gammarideans were taken in all catches by both models of the Juday nets.

Detailed information on the hauls yielding gammarideans is given in Station List (Tables A–D, pages 80 to 83). All the gammarideans captured are considered below[3], together with data on the sampling gear, station number, region, time of capture (D = day; N = night), depth and characteristics of the haul (NBT-PT for IKSAMT, n mfb for TUA 'Sound').

TABLE 1

Gammaridean abundances at different distances above the sea bed
(on basis of hauls of TUA 'Sound' and Juday nets, number of individuals)

Group	Species	TUA 'Sound' 2 mfb	TUA 'Sound' 30 mfb	Juday nets (near-bottom hauls)
Pelagic	*Cyphocaris anonyx*	5	3	–
	C. challengeri	–	2	1
	Stenopleura atlantica	–	1	1
	**Eusirella ?elegans* juv.	–	2	–
	**Stenopleuroides macrops*	18	4	–
	**Halice macronyx*	–	1	–
	Bathystegocephalus globosus	–	1	1
	Parandania boecki	1	–	–
Benthopelagic	**Orchomene pelagica*	1	–	–
	**Eurythenes gryllus* juv.	–	1	–
	**Ichnopus walkeri* sp. nov.	3	–	–
	**Scopelocheiropsis sublitoralis* sp. nov.	2	–	–
	**Parargissa curticornis*	–	1	–
	**Ampelisca brevicornis*	1	–	–
	**Stegocephaloides attingens*	5	–	2
	*?*Eusirus crosnieri* (damaged spcm.)	2	1	–
	**Paramoera austrina*	1	–	–
	**Halicoides tambiella*	2	2	–
	**Halicoides discoveryi*	–	1	1

NB: asterisk (*) indicates amphipods which were found only in the near-bottom hauls (in all material).

3 For a description of the collection of hyperiidean amphipods taken by these catches from the Walters Shoal see G. Vinogradov (1993).

DESCRIPTION OF MATERIAL

KEY TO ABBREVIATIONS IN FIGURES

AI–AII – antennae I and II; **L** – lower lip; **Md** – mandible; **MxI–MxII** – maxillae I and II; **Mxp** – maxilliped; **PI–PVII** – pereopods I–VII (pereopods I and II = gnathopods I and II); **EpIII** – epimeron III; **UI–UIII** – uropods I–III; **T** – telson.

LIST OF SPECIES

Lysianassoidae
Trischizostoma barnardi
Trischizostoma tanjae
Amaryllis maculata sp. nov.
Erikus dahli
Cyphocaris anonyx
Cyphocaris challengeri
Cyphocaris richardi
Cyphocaris faurei
Cyphocaris cornuta
Paracyphocaris praedator
Scopelocheiropsis sublitoralis sp. nov.
Eurythenes gryllus
Eurythenes obesus
Ichnopus pelagicus
Ichnopus walkeri sp. nov.
Thoriella islandica
Orchomenella pelagica

Hyperiopsidae
Parargissa curticornis

Stegocephalidae
Parandania boecki
Bathystegocephalus globosus
Stegocephaloides attingens

Pardaliscidae
Halice tenella
Halice macronyx
Halicoides discoveryi
Halicoides tambiella

Ampeliscidae
Ampelisca brevicornis

Synopiidae
Synopia variabilis

Eusiridae
Eusirus crosnieri
Eusiropsis riisei
Eusirella ?elegans
Stenopleura atlantica
Stenopleuroides macrops
Regalia oculata sp. nov.
Paramoera austrina

Superfamily LYSIANASSOIDAE
(= Family **Lysianassidae** s.l.)

Trischizostoma Boeck, 1861

The species belonging to this genus are semiparasitic. They have strong prehensile pereopods and narrow piercing mouthparts. The genus falls into two distinct groups. The first group includes *T. serratum*, *T. remipes* and *T. paucispinosum*, characterized by telson cleft to middle and weakly specialized mouthparts. They are symbionts of benthic animals, e.g. sponges (K. Barnard 1925). Representatives of the second group rise up into the water column where they occupy an atypical ecological niche for gammaridean amphipods. They are ectoparasites of fishes, mainly of sharks (Stephensen 1935; Vader & Romppainen 1985). These species have telson small entire (only one—*T. crosnieri*—weakly cleft) and highly specialized mouthparts, e.g. maxillae are elongated stylets, mandibles are narrow and have well-developed incisors, maxillipeds are considerably reduced, and they have digitate grooved inner plates.

It is a long time since the existing key to *Trischizostoma* was published in English[4] (J.L. Barnard 1961) and the genus now includes more than twice the number of species as it did then (see Ledoyer 1978; G. Vinogradov 1990*b*, 1991; Lowry & Stoddart 1993, 1994). A new key that includes all the *Trischizostoma* species known to 1996 is provided.

4 Russian key to the genus *Trischizostoma* was published by Vinogradov (1991) and does not include recently described *T. crosnieri* and *T. richeri* (see Lowry & Stoddart 1993, 1994).

Trischizostoma barnardi G. Vinogradov, 1990

Trischizostoma barnardi G. Vinogradov, 1990*b*: 37.

Material

IKSAMT: st. 2598 (MC), D, PT 400 m—1 specimen, 7 mm.

Distribution

Formerly recorded from the Pacific Ocean (submerged Nazka Ridge).

Trischizostoma tanjae G. Vinogradov, 1991

Trischizostoma tanjae G. Vinogradov, 1991: 26.

Material

IKSAMT: st. 2575 (EM), D, NBT 380–400 m—5 ♂, 5–7.5 mm; st. 2576 (EM), D, PT 50–0 m—1 ♀, 6 mm; st. 2823 (EM), D, NBT 390–400 m—139 specimens, 5–7 mm; st. 2826 (EM), N, NBT 390–370 m—3 ♀, 7.5–8 mm, 1 ♂, 7.5 mm, 7 juv., 5–7 mm.

Description

The description of *T. tanjae* published elsewhere was based on this collection, all specimens of which must be regarded as type material. The holotype (♀ reif. 5 mm, from st. 2575) and most of the paratypes are stored in the Zoological Museum of the Moscow State University, Moscow (ZMMU), holotype No Mb–032 and paratypes No Mb–1013 (104 specimens) and Mb–1033. However, 25 paratypes from st. 2823 have been deposited in the South African Museum (catalogue numbers SAM–A40854 to SAM–A40878).

Distribution

Found only near the submerged Error Mountain (Indian Ocean).

Remarks

Sharks, as has already been noted, are the typical hosts of fish-associated semiparasitic *Trischizostoma*. On the Error Mountain, near-bottom catches of commercial fish and shrimp trawls included numerous sharks *Halaelurus hispindus* (Scyliorhinidae). Sharks made up 12 per cent of the total number of caught fishes (Scherbatchev 1989). *Halaelurus hispindus* may be a host of *T. tanjae*. During the *Vityaz* cruise, many *H. hispindus* were caught near the Socotra Island, but unfortunately no IKSAMT trawling was done there to catch amphipods. In other regions, neither *H. hispindus* nor *T. tanjae* were found.

KEY TO THE GENUS *TRISCHIZOSTOMA*

1A. Telson partly cleft 2
1B. Telson entire 5

2A. Pereopod I dactyl inner margin serrate .... *T. serratum*
2B. Pereopod I dactyl inner margin smooth 3

3A. Palm of pereopod I very spinose 4
3B. Palm of pereopod I scarcely spinose .... *T. pincispinosum*

4A. 6th article of pereopod I 1.5 times as wide as long. 7th article of pereopod VII slender (normal dactyl).. *T. crosnieri*

4B. 6th article of pereopod I 2–3 times as wide as long. 7th article of pereopod VII oval .... *T. remipes*

5A. Maxillipedal palp much longer than outer plates of maxillipeds 6
5B. Maxillipedal palp not longer than outer plates of maxillipeds 12

6A. Pereopod I 6th article oval, width exceeding length by at least 1.5 times 7
6B. Pereopod I 6th article of another shape. Width never exceeding length by more than 1.5 times. If length:width ratio approximates to 1.5, the posterior margin of 6th article forms a distinct angle with palmar margin so that article is nearly triangular 10

7A. Pereopod I 6th article spiniferous palmar margin without triangular processes 8
7B. Pereopod I 6th article spiniferous palmar margin with triangular processes .... *T. denticulatum*[5]

8A. Pereopod II 5th article as long as or slightly longer than 3rd article and twice as long as oval 6th article. Pereopod III 2nd article twice as long as 5th article. Pereopod VI 2nd article as long as 4th and 5th articles combined 9
8B. Pereopod II 5th article shorter than 3rd article and not more than 1.5 times as long as pyriform 6th article. Pereopod III 2nd article not longer than 5th article. Pereopod VI 2nd article shorter than 4th and 5th articles combined .... *T. macrochela*[6]

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5 Ledoyer (1978) did not find eyes in *T. denticulatum* but suggested that they may have disappeared as a result of preservation of the specimen. So this character is not included in this key.

6 The description of *T. macrochela* erroneously reported that the palp of maxilla I is completely absent (Vinogradov 1990*b*). Repeated investigation of the holotype shows that a very delicate 1-articulated rudimentary palp of maxilla I (without any setae) is present in *T. macrochela*.

9A. Rostrum length greater than half head. Pereopod VI 2nd article length hardly exceeds its width .... *T. longirostra*
9B. Rostrum length does not exceed half of head. Pereopod VI 2nd article length clearly exceeds its width .... *T. richeri*

10A. Coxa II maximum height equal to that of the corresponding pereonite. Rostrum horizontal, its top reaching beyond peduncle of antenna I 11
10B. Coxa II maximum height equal to half height of corresponding pereonite. Rostrum rounded, its top not reaching beyond peduncle of antenna I ... *T. nicaeense*

11A. Coxae II to VII decreasing in height progressively. Pereopod I 6th article approximately triangular, with pronounced angle between palmar and posterior margins .... *T. rashii*

11B. Coxae II to IV equally high. Coxa V half as high as coxa IV. Other coxae decreasing in height progressively. Pereopod I 6th article irregularly rounded .... *T. circulare*

12A. Maxillipedal palp half as long as outer plates of maxillipeds. Pereopod I 6th article spiniferous palmar margin is even. Pereopods V to VII 2nd articles posterior margins rounded lobate .... *T. nascaensis*
12B. Maxillipedal palp is slightly shorter than outer plates of maxillipeds. Pereopod I 6th article spiniferous palmar margin forming declivitous serrations or pronounced outgrowth. At least pereopod VII 2nd article posterior margin is concave or skewed distally 13

13A. Pereopod II 6th article length exceeds width. Maxillipedal palp with all 3 articles approximately equal in length 14
13B. Pereopod II 6th article width exceeds length. Maxillipedal palp 2nd article twice as long as first or third .... *T. tanjae*

14A. Pereopod I 6th article spiniferous palmar margin with declivitous serrations. Pereopod V 2nd article posterodistal margin skewed. Uropod III rami half as long as peduncle .... *T. barnardi*
14B. Pereopod I 6th article spiniferous palmar margin with a ridge of large outgrowths. Pereopod V 2nd article posterodistal margin forming a round lobe. Uropod III rami slightly longer than peduncle .... *T. cristochelata*

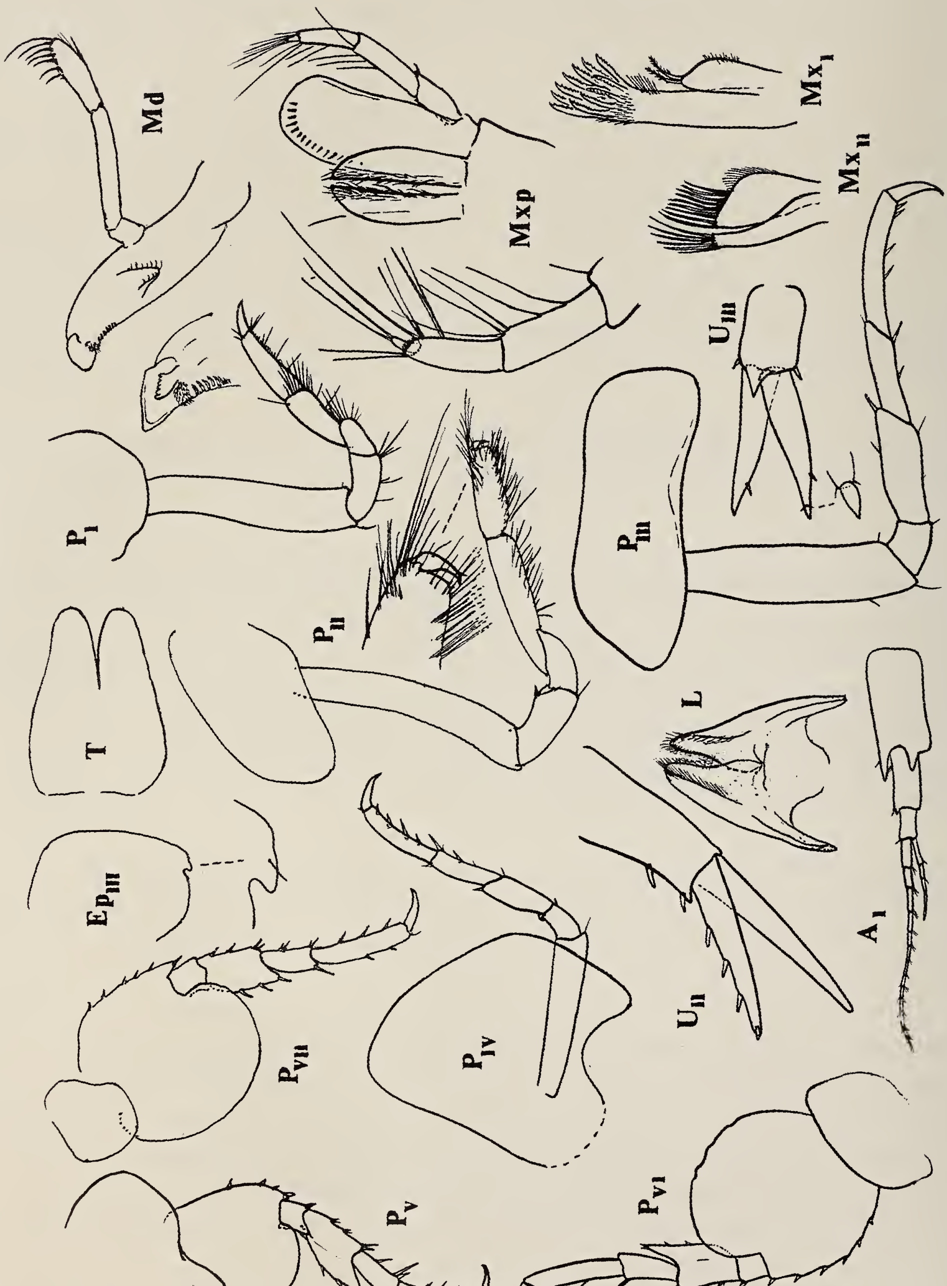

Figure 1
Amaryllis maculata sp. nov. Holotype.

Amaryllis Haswell, 1880

Amaryllis maculata sp. nov.
Fig. 1

Material

IKSAMT: st. 2725 (W), N, NBT 20 m—1 ♀ juv., 6.5 mm (holotype, SAM–A40879).

Type locality

Walters Shoal.

Description

Juvenile female 6.5 mm long. Body smooth, without thorns and carina. Urosome segment I with dorsal depression. Eyes large, black, kidney-shaped.

Antennae I and II in living specimens with red rings around the distal parts of all articles, pereonal, pleonal and urosomal segments also with red bands on posterior margin, centre of coxae IV and V and pereopods VI and VII basal articles each with red spot.

Lateral cephalic lobe large, quadriform, rounded. Rostrum short, blunt, recurved. Antenna I with peduncle articles cylindrical; 1st peduncle article twice as long and broad as 2nd, 2nd twice as long and broader than 3rd, flagellum 12-articulate, accessory flagellum 5-articulate. Antenna II subequal to antenna I.

Lower lip lacking inner lobes and with narrow mandibular processes.

Mandible, incisor smooth, spine row well developed, molar weak, conical; palp attached slightly proximal to molar, palp second article linear, 1.5 times as long as article 3. Maxilla I lacking palp; outer plate narrow, linear, longer than inner, with 11 serrate teeth distally, medial margin with fine setae distally, inner plate with 2 pinnate setae distally, medial margin setulose. Maxilla II inner and outer plates subequal, outer plate narrower than inner, both having long, strong spine-setae distally.

Maxilliped inner plate well developed, narrow, reaching ⅔ along outer; outer plate elongate with distomedial row of small submarginal spines, palp slightly exceeding outer plate, bearing few weak long setae, 4th article rudimentary, bearing two long apical setae.

Pereopod I simple, short, second article linear, slightly bent, as long as articles 4–7 combined; article 6 slightly longer than article 5. Pereopod II subchelate, 2nd article linear, shorter than articles 4–6 combined, 5th article sublinear, about 1.5 times as long as 6th; palm short, not lunate, sub-straight, dactyl short and covering 100 per cent of palmar edge.

Coxa III and IV much deeper than II; coxa IV substantially excavate posteriorly with posteroventral lobe somewhat round, pointed dorsally. Pereopods III and IV subequal, 2nd article linear, equal to 5th and 6th articles combined, 4th subequal to 5th but broader; 6th article linear, slightly curved, 1.2–1.5 times as long as 5th. Coxae V–VII height decreasing from V to VII. Coxa V with weak posterior lobe. Pereopod V shorter than subequal VI and VII. Pereopods V–VII article 2 with well developed rounded posteroventral lobe; article 4 expanded posteriorly and bearing few spines along anterior and posterior margins; pereopods V–VII article 6 linear, longer and slightly narrower than article 5; dactyl strong and slightly curved.

Epimeron III weakly extended posteriorly with small sinus posteroventrally.

Uropod I peduncle with lateral row of spines; uropod II inner ramus shorter than outer ramus, bearing row of spines; uropod III aequiramous, ordinary, peduncle short with apicomedial tooth, outer ramus 2-articulate.

Telson cleft 50 per cent of length, width 70 per cent of length, lateral margins slightly excavate, narrowly gaping with apically rounded lobes.

Remarks

Many details of the morphology of *A. maculata* sp. nov., i.e. form of the eyes and rostrum, mandibular palp, form and proportions of pereopod articles, resemble those of *A. macrophthalma*. However, *A. maculata* has maxilliped outer plates of another form, maxilla II with broad inner plate, telson with concave edges and some other characters, which clearly separate it from *A. macrophthalma*.

Neither our specimen of *A. maculata* sp. nov., nor J. Barnard's specimen of *A. macrophthalma* (see Barnard 1972), have the inner edge of uropod II inner ramus incised. Such an incision is shown for *A. macrophthalma* by Stebbing (1888) and is found on other species of the genus and in closely related genera (*Erikus*, for example), though it is not shown by *Bathyamaryllis* (see Pirlot 1933). This incision is also absent in the new species of this lysianassoid group described from the Red Sea. It constituted the main reason for the description of the genus *Pseudoamaryllis* by Andres (1981). But, as can be seen, this character is not reliable, so the validity of *Pseudoamaryllis* may be doubtful.

Biotope

This individual was caught on the top of Walters Shoal. Based on the results of Sigsbee trawlings, diving and TV observations, the top was covered by stones with narrow gaps between them, covered by thalloid red algae and encrusted by dominant calcareous coralline algae *Mesophyllum syrphetodes*—see Collet & Parin (1991). This article includes a photograph of the bottom at st. 2691 of the R/V *Vityaz*, taken at practically the same position as st. 2725 (Collet & Parin 1991, fig. 2).

Erikus Lowry & Stoddart, 1987

Erikus dahli Lowry & Stoddart, 1987
Fig. 2.

Erikus dahli Lowry & Stoddart, 1987: 1304.

Material

IKSAMT: st. 2799 (SdM), N, NBT 300–220 m—3 ♂, 6–6.5 mm (SAM–A40880).

Distribution

Temperate water near the Chile coast. Lowry & Stoddart (1987) assumed that some species of this genus were found near South Africa. A new record from Saya de Malha Bank broadens the known distribution of this species.

Remarks

Our specimens correspond to the description and figures of typical specimens. However, our animals are noticeably smaller than the holotype (21.4 mm) and one of the paratypes (13 mm), although other paratypes have lengths between 6 and 7 mm, similar to our specimens.

Cyphocaris Boeck, 1871

Cyphocaris anonyx Boeck, 1871

Cyphocaris anonyx Boeck, 1871: 104; 1872: 141. Schellenberg, 1926*a*: 210. Birstein & Vinogradov, 1955: 212. *Non* Chilton, 1912: 464.
Cyphocaris micronyx Stebbing, 1888: 656. Chevreux, 1900: 165.

Material

IKSAMT: st. 2575 (EM), D, PT 380–400 m—4 specimens, 8.5–10.5 mm; st. 2597 (MC), N, NBT 360–550 m—1 specimen, 6.5 mm; st. 2604 (MC), N, NBT 680 m—8 specimens, 4–12 mm; st. 2642 (MC), N, PT 1200 m—1 specimen, 10.5 mm; st. 2714 (W), D, NBT 1 000 m—8 specimens, 8.5–11 mm; st. 2717 (W), N, PT 1 000 m—6 specimens, 9.5–12.5 mm; st. 2720 (W), D, PT 850–730 m—8 specimens, 8–12 mm; st. 2799 (W), D, PT 620–600 m—6 specimens, up to 12 mm; st. 2773 (W), N, PT 1 150 m—6 specimens, up to 13 mm; st. 2788 (SdM), N, PT 400 m—1 specimen, 10 mm; st. 2789 (SdM), N, PT 1 000 m—10 specimens, 11.5–13 mm. **TUA 'Sound'**: st. 2661 (MC), D, 300–260 m (2 mfb)—4 juv., 3 mm each; st. 2678 (W), N, 840–820 m (2 mfb)—1 damaged specimen; st. 2681 (W), N, 450–480–310 m (30 mfb)—1 damaged specimen; st. 2737 (W), D, 1 085–1 090 m (30 mfb)—1 specimen, 6 mm and 1 exuviae; st. 2798 (SdM), N, 230–255 m (30 mfb)—1 juv. specimen.

Distribution

Cosmopolitan, meso- and bathypelagic.

Cyphocaris challengeri Stebbing, 1888

Cyphocaris challengeri Stebbing, 1888: 661; 1906: 29. Schellenberg, 1926*a*: 243. G. Vinogradov, 1990*b*: 40.
Cyphocaris alicei Chevreux, 1905*b*: 1. Walker, 1909: 327. *Non* Strauss, 1909: 67.
Cyphocaris kincaidi Thorsteinson, 1941: 58.

Figure 2
Erikus dahli. Male, length 6.5 mm. St. 2799.

Material

IKSAMT: st. 2578 (EM), N, PT 380–400 m—10 specimens, 8–14 mm; st. 2598 (MC), D, PT 400 m—3 specimens, 5.5–8 mm; st. 2605 (MC), D, PT 460–700 m—1 specimen, 10 mm; st. 2675 (W), N, PT 1 000 m—1 specimen, 12 mm; st. 2712 (W), N, PT 100 m—1 specimen, 9 mm; st. 2714 (W), D, NBT 850–650 m—1 specimen, 10.5 mm; st. 2719 (W), N, PT 200 m—1 specimen, 11 mm; st. 2720 (W), D, PT 850–730 m—2 specimens, 10 mm each; st. 2727 (W), N, PT 150 m—1 specimen, 8 mm; st. 2773 (W), N, PT 1 150 m—4 specimens, up to 13 mm; st. 2776 (W), N, PT 200 m—5 specimens, up to 9 mm; st. 2777 (W), N, PT 200 m—3 specimens, up to 10 mm; st. 2787 (SdM), N, PT 100 m—21 specimens, up to 15 mm; st. 2788 (SdM), N, PT 400 m—10 specimens, up to 13 mm; st. 2789 (SdM), N, PT 1 000 m—10 specimens, 9.5–14.5 mm; st. 2794 (SdM), D, NBT 300–650 m—59 specimens, 7–11 mm; st. 2799 (SdM), N, NBT 300–200 m—9 specimens, 7–10 mm; st. 2800 (SdM), N, PT 200 m—3 specimens, up to 8 mm; st. 2805 (SdM), D, PT 200 m—14 specimens, up to 10 mm; st. 2807 (SdM), N, NBT 200 m—12 specimens, up to 13 mm. **TUA 'Sound'**: st. 2647 (MC), N, 400–470 m (30 mfb)—1 specimen, 4 mm; st. 2655 (MC), N, 1 210—1 215 m (2 mfb)—1 exuviae, 11 mm; st. 2792 (SdM), D, 266 m (30 mfb)—1 juv., 4 mm. **ODN 80/113**: st. 2586 (0°27'N 56°03'E – Equator Mountain), N, 500–250 m—1 ♀, 12 mm, with 49 eggs in marsupium; st. 2656 (MC), N, 1 000–500 m—1 juv., 3 mm.

Distribution

Atlantic, Pacific, Indian and Southern Oceans, mesopelagic.

Cyphocaris richardi Chevreux, 1905

Cyphocaris richardi Chevreux, 1905*a*: 1. Schellenberg, 1926*a*: 245. 1926*b*: 206. Birstein & Vinogradov, 1955: 12.
Cyphocaris anonyx Chilton, 1912: 464 (*non* Boeck, 1871:104).

Material

IKSAMT: st. 2616 (MC), N, PT 1 700–1 900 m—1 specimen, 23 mm; st. 2717 (W), N, PT 1 000 m—1 juv., 13.5 mm; st. 2773 (W), N, PT 1 150 m—7 specimens, up to 12 mm; st. 2789 (SdM), N, PT 1 000 m—1 specimen, 24 mm.

Distribution

Cosmopolitan, abysso- and bathypelagic.

Cyphocaris faurei Barnard, 1916

Cyphocaris faurei K. Barnard, 1916: 117. Schellenberg, 1926*a*: 215. G. Vinogradov, 1990*b*: 41.
Cyphocaris alicei Strauss, 1909: 67 (*non* Chevreux, 1905*b*: 1).

Material

IKSAMT: st. 2604 (MC), N, NBT 680 m—7 specimens, 9–30 mm; st. 2605 (MC), D, PT 460–700 m—3 specimens, 17, 25 and 28 mm; st. 2616 (MC), N, PT 1 700–1 900 m—1 specimen, 29 mm; st. 2789 (SdM), N, PT 1 000 m—1 specimen, 22 mm.

Distribution

Circumoceanic in southern hemisphere, also in the Gulf of California, mesopelagic.

Cyphocaris cornuta Ledoyer, 1978

Cyphocaris cornuta Ledoyer, 1978: 375.

Material

TUA 'Sound': st. 2655 (MC), N, 1 190–1 210 m (30 mfb)—1 exuviae, 10 mm.

Distribution

Mozambique Channel.

Paracyphocaris Chevreux, 1905

Paracyphocaris praedator Chevreux, 1905

Paracyphocaris praedator Chevreux, 1905*c*: 1. Shoemaker, 1945: 189. Bowman & Wasmer, 1984: 844.

Material

IKSAMT: st. 2616 (MC), N, PT 1 700–1 900 m—1 ♂, 8 mm.

Distribution

Cosmopolitan, bathypelagic.

Remarks

Bowman & Wasmer (1984) found three *P. praedator* among the attached eggs of the shrimp *Oplophorus novaezeelandie*. They suggested that *P. praedator* is an egg-mimic that feeds on the *Oplophorus* eggs. The prehensile pereopods of *Paracyphocaris* prevent it from being dislodged by the host's grooming.

Scopelocheiropsis Schellenberg, 1926

Scopelocheiropsis sublitoralis sp. nov.
Fig. 3.

Material

TUA 'Sound': st. 2661 (MC), D, 300–258 m (2 mfb)—1 ♂, 4.5 mm (holotype, SAM–A40881) and 1 juv., 2.5 mm (paratype). Paratype is stored in the P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences.

Bottom at st. 2661

Mud with sand.

Type locality

Mozambique Channel.

Description

Male, 4.5 mm. Body smooth, without thorns. Urosomit I with low convex carina. Rostrum small. Epistome hangs over upper lip.

Antenna I shorter than II, peduncle articles broad, the length of each article less than breadth, 1st article longer than 2nd and 3rd combined. Flagellum proximal articles fused conical. Distal part of flagellum 8-articulate. Accessory flagellum 3-articulate. 1st article longer than 2nd and 3rd combined. Antenna II peduncle articles broad, subrectangular, margin with few transverse rows of short setae; flagellum 27-articulate.

Lower lip lacking inner lobes, mandibular process narrow.

Mandible, incisor smooth convex, lacinia mobilis well developed, spine row short, molar absent. Palp strong, 2nd article much longer than 3rd, both with a row of long setae distally on medial margin.

Maxilla I inner plate shorter than outer, with row of 10 pinnate setae. Palp well developed, 2nd article expanded distally, apex broad, truncate with 7 apical spines (forked or serrate).

Maxilla II plates subequal, distal margin of both plates having row of long strong setae varying from pinnate to smooth.

Maxilliped well developed, palp 4-articulate, inner plate reaching middle of palp article 1, apex truncate with 4 short rounded spines, present a row of long pinnate setae apicomedially; outer plate oval, nearly reaching distal margin of palp article 3, bearing 3 long pinnate setae apically and row of long spines on medial margin.

Coxae I–IV not densely setose distally. Coxa I trapeziform, expanded distally, anterodistal angle blunt. Pereopod I scopelocheirin in structure, article 2 equal to articles 5 and 6 taken together, 6th longer than 5th, dactyl very vestigial and shrouded in setae. Pereopod II subequal to pereopod I; 5th article drop-like, 6th rounded-oval, 1.5 times longer than wide, dactyl emanating from middle of article 6 apex, palm straight, short, one half of the distal margin, both articles 5 and 6 thickly covered by short and long setae.

Pereopods III and IV stout, 2nd articles dilated distally and equal to 5th and 6th articles

Figure 3
Scopelocheiropsis sublitoralis sp. nov. Holotype.

taken together, 5th article 1.5 times shorter than wide, its posterodistal corner with setae and short spines, 6th article conical, 2.5 times longer than 5th, with short spines on the posterior margin and strong blunt spine at base of dactyl.

Pereopod V slender, 2nd article oblong-oval without distal lobe, dactyl sharp and slightly curved, one quarter as long as 6th article. Pereopod VII 2nd article broad, anterior margin concave distally and convex proximally, posterodistal lobe obliquely blunted distally and not overreaching 3rd article, 4th and 5th articles subequal, 6th rather slender and longer, dactyl short and sharp.

Epimeron III posterodistal angle broadly rounded.

Uropod II peduncle subequal to outer ramus, inner ramus slightly shorter than outer, peduncle medial margin and inner ramus with short marginal spines, outer ramus lateral margin with one strong lateral spine in distal half. Uropod III rami subequal, longer than peduncle, outer ramus article 2 very small, inner ramus medial margin with row of long pinnate setae.

Telson ovoid, cleft beyond middle, each lobe with setule notch, lateral margin armed dorsally with row of three short spines.

Remarks

The main distinctive features of the new species (cf. *Scopelocheiropsis abyssalis*, the only other species of the genus) are the following: mandible with cutting edge well developed; coxa I considerably widened distally; pereopods I and II subequal in length, their 6th articles half as long again as the 5th; pereopod II 6th article slightly longer than wide; pereopods III and IV 5th articles relatively long, with triangular anterodistal lobes; pereopods V–VII 2nd articles of different shape, dactyls shorter.

Eurythenes Smith in Scudder, 1882

Eurythenes gryllus (Lichtenstein in Mandt, 1822)
Fig. 4.

Gammarus gryllus Lichtenstein in Mandt, 1822: 34.
Lysianassa magellanica Milne Edwards, 1848: 398.
Eurytenes magellanicus Liljeborg, 1865: 11.
Eurythenes gryllus Smith, 1884: 54. Stephensen, 1933: 12 (partim). Gurjanova, 1951: 265. Birstein & Vinogradov, 1955: 25. Barnard, 1961: 35.
Euryporeia gryllus Sars, 1891–1895: 86. Chevreux, 1900: 24.

Material

TUA 'Sound': st. 2703 (W), N, 995–985 m (30 mfb)—1 juv., 11 mm (SAM–A40882).

Distribution

Meso-, bathy- and abyssopelagic, 5 000–6 000 m. Panoceanic, including the Arctic Basin and the Antarctic, inhabiting middle and near-bottom waters, feeding on carcasses

Figure 4
Eurythenes gryllus juv., length 11 mm. St. 2703, TUA 'Sound' (30 mfb).

of fishes and other big animals. It gathers in large numbers on bait. Comparatively large specimens up to 95 mm in length are commonly found in the water column. However, juveniles and very large females (100–120 mm) are recorded only in the near-bottom layers, where they can burrow into the substrate to avoid danger (Birstein and Vinogradov 1958; Baldwin and Smith 1987).

Remarks

Details of morphology of our specimen correspond to existing descriptions and figures of *E. gryllus*, except for two: in contrast to the figure published by Sars (1891–1895) and repeated by Gurjanova (1951), our animal has maxilla II inner and outer plates subequal and maxilliped inner plates with stretched spine-like (not rounded) tops.

Eurythenes obesus (Chevreux, 1905)

Katius obesus Chevreux, 1905*d*: 1. Stephensen, 1933: 12 (partim).
Eurythenes obesus Schellenberg, 1955: 183. Shoemaker, 1956: 177. Birstein & Vinogradov, 1960: 184; 1962: 39; 1964: 163. J. Barnard, 1961: 38.

Material

IKSAMT: st. 2718 (W), N, PT 100 m—1 ♂, 11 mm; st. 2719 (W), N, PT 200 m—1 ♂, 12 mm; st. 2773 (W), N, PT 1 150 m—1 specimen, 11 mm.

Distribution

Cosmopolitan, bathy- and abyssopelagic.

Ichnopus Costa, 1853

Ichnopus pelagicus Schellenberg, 1926

Ichnopus pelagicus Schellenberg, 1926*b*: 218. Birstein & Vinogradov, 1964: 163. Lowry & Stoddart, 1992: 216.
Socarnes longicornis Birstein & Vinogradov, 1960: 185. Gurjanova, 1962: 433.
?*Ichnopus nossibeensis* Ledoyer, 1986: 761.

Material

IKSAMT: st. 2597 (MC), N, NBT 360–550 m—1 ♂, 9.5 mm; st. 2625 (MC), N, NBT 210–220 m—9 specimens, 7–9.5 mm; st. 2799 (SdM), N, NBT 300–200 m—12 specimens, 6–10.5 (♂ reif.) mm; st. 2800 (SdM), N, PT 200 m—1 specimen, 10 mm; st. 2801 (SdM), N, PT 50 m—1 ♂, 8.5 mm.

Distribution

Tropical Pacific and Indian Oceans.

Figure 5
Ichnopus walkeri sp. nov. Holotype.

Ichnopus walkeri sp. nov.
Fig. 5.

Ichnopus taurus Walker, 1904: 238 (*non* Costa, 1853: 72).
Ichnopus sp. Lowry & Stoddart, 1992: 241, fig. 38 (based on Walker's material).

Material

TUA 'Sound': st. 2635 (MC), D, 223 m (2 mfb)—2 juv., 4 mm (holotype, SAM–A40883) and 5 mm (SAM–A40884); st. 2676 (W), D, 1 058–1 068 m (2 mfb)—1 juv., 3.5 mm. One paratype is deposited in the P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences.

Bottom at st. 2635 and 2676

Muddy.

Etymology

The species was named after Dr A.O. Walker, who first dealt with this animal (see *Remarks*).

Type locality

Mozambique Channel.

Description

Juvenile male 4 mm long. Body smooth, lacking thorns and carina. Eyes large, kidney-shaped, nearly contiguous mid-dorsally. Epistome separated from the upper lip.

Antenna I peduncle barrel-like, 1st article twice as long as 2nd and 3rd taken together, 1st article breadth equal to length; 2nd article shortest. Flagellum proximal articles fused into cone shape, callynophorate, distal part 10-articulate. Accessory flagellum well developed, 3-articulate, 1st article longest. Antenna II slightly longer than antenna I, flagellum 15-articulate, proximal articles with calceoli.

Mandible, incisor, smooth convex, spine row short, molar strong, conical, covered by numerous setae and marginal spines. Palp narrow, weakly armed, slightly longer than mandible itself, attached at level of molar, 3rd article weakly curved, shorter and narrower than linear 2nd article.

Maxilla I inner plate oval with 2 pinnate setae apically, outer plate linear, longer than inner plate; palp 2nd article truncate, apex armed with teeth, 5 small blunt spines and one thick short seta.

Maxilla II inner plate shorter and slightly narrower than outer. Both plates armed by long strong spine-setae.

Maxilliped weakly armed, inner plate reaching apex of palp 1st article, with straight cutting edge distally, bearing small teeth and 2 setae; outer plate petal-like, broadly oval, thin, reaching apex of palp 3rd article, medial margin with submarginal row of short spines; palp greatly exceeding outer plate; dactyl elongate, unguiform, with short nail and accessory setules.

Coxa I deep, with somewhat concave anterior and posterior margins, anterodistal angle rounded. Pereopod I 2nd article about 0.9 times as long as coxa I and subequal to the 5th and 6th articles taken together; 3rd, 5th and 6th articles subequal, 5th article linear, 6th narrow-conical. Dactyl curved, spoon-like, with band of strong setae distally, deeply serrated on both margins with curved hook-like apex. Pereopod II longer than pereopod I, 2nd article slender, subequal to 4th, 5th and 6th articles taken together; 6th article slightly shorter than 5th, oval with short palm.

Pereopods III–IV strong, 4th article 1.6 times as long and 1.8 times as broad as 5th article, slender 6th article subequal to 4th. Coxa IV deep with dorsally subsharp posteroventral lobe.

Pereopod VI longer than V, VII longer than VI, each 2nd article with posteroventral lobe well developed, rounded. Pereopod V has this lobe rounded with very weak sloping teeth. Pereopod V 5th article also with weak posteroventral lobe; 6th article longer than 5th. Pereopods VI and VII 2nd article lobes with straight, smooth posterior margin; 6th article longer than 5th (but not so strong as in pereopod V). 4th articles of pereopods V–VII with parallelogrammiform posteroventral lobes most developed on pereopod V which is 1.7 times broader than long.

Uropod I peduncle larger than rami. Uropod II peduncle and rami subequal. Uropod III peduncle shorter than rami.

Telson lobes triangular, 1.3 times as long as broad basally, cleft per cent of length, each apex with spine and small setule.

Distribution

Also found near Sri Lanka at a depth of about 200 m (Walker 1904; Lowry & Stoddart 1992).

Remarks

Ichnopus walkeri sp. nov. is similar to the group of species which formerly were attributed to the genus *Glycerina* Haswell, 1882. This genus was included into *Ichnopus* in the latest revision (Lowry & Stoddart, 1992). However, all other known species of this group—*I. tenuicornis* (Haswell, 1879), *I. woodmasoni* (Giles, 1890) and *I. teretis* (Andres, 1981)—have deeply indentured article 2 of pereopod V.

The new species is also similar to *I. comorensis* Lowry & Stoddart, 1992, *I. spinicornis* Boeck, 1861 and *I. taurus* Costa, 1853. *Ichnopus comorensis* and *I. spinicornis* differ from *I. walkeri* in having a shorter and distally broadened coxal plate I, short 3rd article of pereopod I and more or less broadly rounded tops of telson's lobes. Also, in *I. spinicornis* 2nd article of pereopod I is broader than in the new species. *Ichnopus taurus* differs from *I. walkeri* in having arming of maxilla I palp (8 separate distal denticles instead of 5 in *I. walkeri* and another indentation of outer distal corner), numerous marginal setae on mandibular palp 3rd article and smaller spines on the mandibular molar.

However, I have no doubt that our specimen belongs to the same species as the animal which was caught near Sri Lanka in 1902 during a cruise of S/S *Lady Havelock,* and was identified by Dr A.O. Walker as *I. taurus* (Walker 1904). Later, Lowry & Stoddart re-examined this specimen and showed that it is not *I. taurus,* and marked it as

Ichnopus sp. (Lowry & Stoddart 1992). Unfortunately, I have not had the opportunity to examine Walker's specimen (Natural History Museum, London; catalogue numbers 1905.2.18:9 and 1905.2.18:304) but fig. 38 and the description in Lowry and Stoddart (1992) helped to resolve this issue.

Thoriella Stephensen, 1915

Thoriella islandica Stephensen, 1915

Thoriella islandica Stephensen, 1915: 39. Shoemaker, 1945: 201. G. Vinogradov, 1990*b*: 41.

Material

IKSAMT: st. 2575 (EM), D, NBT 380–400 m—1♂, 11 mm (SAM–A40885).

Distribution

Cosmopolitan.

Orchomenella Sars, 1895

A few similar genera of lysianassoids (*Orchomene*, *Orchomenella*, *Orchomenopsis*, *Allogaussia*, *Tryphosa*) had been described previously but later, many species with an intergradation of characters were described and Barnard (1964*a*, 1969) declared that all these genera were synonyms of the genus *Orchomene*. Following this, additional revisions were made and the status of some 'old' orchomenoid groups of species changed to subgeneric or generic levels. Now *Orchomenella* is again considered to be a valid genus (Barnard & Karaman 1991; Lowry & Stoddart 1994).

Orchomenella pelagica Birstein & M. Vinogradov, 1960

Orchomenella pelagica Birstein & Vinogradov, 1960: 189.

Material

TUA 'Sound': st. 2676 (W), D, 1 058–1 068 m (2 mfb)—1 specimen, 6 mm.

Bottom at st. 2676

Muddy.

Distribution

Tropical Pacific and Indian Oceans.

Family **Hyperiopsidae**
Parargissa Chevreux, 1908

Parargissa curticornis Birstein & M. Vinogradov, 1960

Parargissa curticornis Birstein & Vinogradov, 1960: 199.

Material

TUA 'Sound': st. 2655 (MC), N, 1 990–1 210 m (30 mfb)–1 ♂ reif., 25 mm (SAM–A40886).

Distribution

Equatorial regions of the West Pacific and Indian Oceans, meso- and bathypelagic.

Family **Stegocephalidae**
Parandania Stebbing, 1906

Parandania boecki (Stebbing, 1888)

Andania boecki Stebbing, 1888: 735.
Parandania boecki Stebbing, 1906: 95. Schellenberg, 1926*a*: 223. K. Barnard, 1932: 77.

Material

IKSAMT: st. 2717 (W), N, PT 1 000 m—1 specimen, 10 mm; st. 2773 (W), N, PT 1150 m—1 specimen, 9 mm; st. 2789 (SdM), N, PT 1 000 m—1 specimen, 13.5 mm. **TUA 'Sound'**: st. 2649 (MC), N, 958–968 m (2 mfb)—1 juv., 2 mm. **BDN 37/50**: st. 2740 (W), N, 250–100 m—1 specimen, 9 mm.

Bottom at st. 2649

Muddy with holes, covered by numerous Hyalospongia (observed on TV monitor of TUA 'Sound').

Distribution

Cosmopolitan, bathypelagic.

Remarks

There are observations showing that *P. boecki* feeds upon Cnidaria, in particular, on the medusae of the genus *Atolla* (Moore & Rainbow 1989; Coleman 1990).

Bathystegocephalus Schellenberg, 1926

Bathystegocephalus globosus (Walker, 1909)

Stegocephalus globosus Walker, 1909: 329.
Stegocephalus valdiviae Strauss, 1909: 72.
Bathystegocephalus globosus Schellenberg, 1926*b*: 221. Birstein & Vinogradov, 1960: 205.

Material

IKSAMT: st. 2675 (W), N, PT 1 000 m—1 specimen, 6 mm; st. 2713 (W), N, PT 200 m—2 specimens, 5 mm each; st. 2714 (W), D, NBT 850–650 m—242 specimens, 4.5–12 mm; st. 2718 (W), N, PT 100 m—5 specimens, 4.5 mm each; st. 2719 (W), N, PT 200 m—32 specimens, 4.5–12.5 mm; st. 2720 (W), D, PT 850–730 m—2 specimens, 7 and 9 mm; st. 2726 (W), N, PT 100 m—5 specimens, 3–7 mm; st. 2727 (W), N, PT 150 m—51 specimens, 4–11 mm; st. 2729 (W), D, PT 620–600 m—2 specimens, 4 mm each; st. 2773 (W), N, PT 1 150 m—7 specimens, up to 13 mm; st. 2775 (W), N, PT 100 m—7 specimens, up to 7 mm; st. 2776 (W), N, PT 200 m—57 specimens, 5–9 mm; st. 2777 (W), N, PT 550 m—9 specimens, up to 9 mm; st. 2785 (SdM), N, PT 600 m—2 specimens, 4 and 11 mm; st. 2787 (SdM), N, PT 100 m—3 specimens, 10 mm each; st. 2788 (SdM), N, PT 400 m—2 specimens, 3 and 7 mm; st. 2805 (SdM), D, NBT 200 m—1 368 specimens, 3–12 mm; st. 2807 (SdM), N, NBT 200 m—18 specimens, 4–8 mm. **TUA 'Sound'**: st. 2757 (W), D, 430–450 m (30 mfb)—1 specimen, 3 mm. **BDN 37/50**: st. 2744 (W), N, 920–500 m—1 specimen, 9 mm.

Distribution

Tropical and subtropical regions in all oceans in the southern hemisphere.

Stegocephaloides Sars, 1895

Stegocephaloides attingens K. Barnard, 1916

Stegocephaloides attingens K. Barnard, 1916: 131.

Material

TUA 'Sound': st. 2647 (MC), N, 402–428 m (2 mfb)—1 juv., 3 mm; st. 2661 (MC), D, 300–258 m (2 mfb)—4 specimens, up to 6 mm. **ODN 80/113**: st. 2648 (MC), N, 450–250 m —1 juv., 2 mm. **BDN 37/50**: st. 2710 (W), N, 450–240 m—1 specimen, 3 mm.

Bottom at st. 2647 and 2661

Muddy, at st. 2647 with numerous holes (observed on TV monitor of TUA 'Sound').

Distribution

South Africa, 250–1 000 m.

Family **Pardaliscidae**
Halice Boeck, 1871

Halice tenella Birstein & M. Vinogradov, 1962

Halice tenella Birstein & Vinogradov, 1962: 49; 1964: 168.

Material

IKSAMT: st. 2799 (SdM), N, NBT 300–200 m (trawl touched the bottom)—1 specimen, 5.5 mm.

Distribution

Indian Ocean in the Southern Hemisphere.

Remarks

Capture of this typically pelagic animal cannot be connected with the trawl touching the bottom.

Halice macronyx (Stebbing, 1888)

Synopioides macronyx Stebbing, 1888: 1000; 1906: 227. Schellenberg, 1926*b*: 225. *Non* K. Barnard, 1930: 363

Halice macronyx Birstein & Vinogradov, 1962: 48.

Material

TUA 'Sound': st. 2637 (MC), N, 930–(0) m (the locking mechanism was out of order)—1 specimen, 7 mm; st. 2746 (W), D, 950 m (30 mfb)—1 specimen, 8 mm.

Distribution

Circumoceanic in the Southern Hemisphere.

Halicoides Walker, 1896

Halicoides discoveryi Thurston, 1976

Halicoides discoveryi Thurston, 1976: 149.

Material

TUA 'Sound': st. 2798 (SdM), N, 230–250 m (30 mfb)—1 ♂, 4 mm (SAM–A40887).
BDN 37/50: st. 2758 (W), D, 500–250 m—1 specimen, 3 mm.

Distribution

Formerly recorded only in the Atlantic Ocean near the Canary Islands, in the few pelagic hauls from 2 300 to 500 m.

Halicoides tambiella (J. Barnard, 1961)

Pardisynopia tambiella J. Barnard, 1961: 79. G. Vinogradov, 1990*b*: 44.
Halice tambiella Karaman, 1974: 10.
Halicoides tambiella Thurston, 1976: 149.

Material

IKSAMT: st. 2689 (W), D, NBT 500 m (trawl touched the ground)—3 ♂, 5 mm each. **TUA 'Sound'**: st. 2709 (W), N, 530–490 m (30 mfb)—1 specimen, 6 mm; st. 2757 (W), D, 430–530 m (30 mfb)—1 specimen, 5 mm; st. 2797 (SdM), N, 248–258 m (2 mfb)—2 specimens, 4 mm each.

Bottom at st. 2797

Sandy with ripples. One patch of starfishes was observed on TV monitor of TUA 'Sound'.

Distribution

Indo-Pacific.

Remarks

The species was frequently found in benthopelagic trawlings on the Pacific submerged ridges Nazka and Sala-y-Gomez (Vinogradov 1990*b*). However, the type specimen was taken by the grab in the Tasman Sea (Barnard 1961), so this is a true benthopelagic species. The morphology of the present material is comparable with that from the Pacific.

Family **Ampeliscidae**
Ampelisca Kröyer, 1842

The genus includes more than 100 species. The majority are littoral, but 20 species are bathyal and one is abyssal. Commonly ampeliscids live on soft grounds in muddy tubes, often forming dense populations. Observations on *Ampelisca typica*, and a few other species have, however, shown that in the second half of the night ampeliscids vacate their tubes and swim in the plankton, although they do not come near to the sea surface (Mills 1967; Macquart-Moulin 1968; Kaim-Malka 1969; Macquart-Moulin *et al.* 1987).

Ampelisca brevicornis (Costa, 1853)

Araneops brevicornis Costa, 1853: 171.
Ampelisca laevigata Liljeborg, 1855: 123. Sars, 1891–1895: 169.

Tetromatus bellianus Bate, 1856: 58; 1857: 139.
Ampelisca brevicornis Della Valle, 1893: 473 (partim).

Material

TUA 'Sound': st. 2624 (MC), N, 218 m (2 mfb)—1 specimen, 8 mm.

Bottom at st. 2624

Sandy with mud.

Distribution

Cosmopolitan in latitudes below 45°.

Remarks

Very polymorphic species (Schellenberg 1925; Reid 1951).

Family **Synopiidae**
Synopia Dana, 1852

Synopia variabilis Spandl, 1923

Synopia variabilis Spandl, 1923: 18; 1924: 48. J. Barnard, 1965: 494.

Material

Neuston net near underwater lamp at night: st. 2557 (Red Sea, 21°06'N 38°12'E), N, 0–0.5 m—10 specimens, up to 4 mm.

Distribution

Red Sea, Ifaluk and Eniwetok Atolls.

Remarks

Animals reddish in colour, but eggs in marsupiums blue, which is typical of neustonic animals.

Family **Eusiridae**
Eusirus Kröyer, 1845

Eusirus crosnieri Ledoyer, 1978

Eusirus crosnieri Ledoyer, 1978: 369.

Material

IKSAMT: st. 2714 (W), D, NBT 850–650 m (trawl touched the ground)—1 specimen, 7 mm.

Distribution

Mozambique Channel and Madagascar Plateau.

Remarks

See also *Eusirus* sp.

Eusirus sp.

Material

IKSAMT: st. 2823 (EM), D, NBT 390–400 m—1 specimen. **TUA 'Sound'** st. 2655 (MC), N, 1 215–1 220 m (2 mfb)—1 specimen, 5 mm; st. 2660 (MC), D, 133–78 m (2 mfb)—1 exuviae, 17 mm; st. 2709 (W), N, 438–558 m (30 mfb)—1 specimen, 5 mm; st. 2757 (W), D, 490–455 m (2 mfb)—1 specimen, 5 mm.

Bottom

Sandy with mud at st. 2655 and sandy with stones at st. 2757.

Remarks

Specimens damaged, making accurate identification impossible; the species is probably *E. crosnieri*.

Eusiropsis Stebbing, 1899

Eusiropsis riisei Stebbing, 1897

Eusiropsis riisei Stebbing, 1897: 39.

Material

IKSAMT: st. 2576 (EM), D, PT 50–0 m—1 ♂, 8.5 mm; st. 2604 (MC), N, NBT 680 m—1 specimen, 9 mm; st. 2799 (SdM), N, NBT 300–200 m—1 ♀, 8.5 mm and 1 ♂, 9 mm; st. 2805 (SdM), D, NBT 200 m—1 ♂, 11 mm; st. 2827 (EM), N, PT 400 m—2 specimens, 9 and 10 mm.

Distribution

Circumtropical, epipelagic.

Eusirella Chevreux, 1908

Eusirella is a deep-sea genus. As a rule representatives are caught in depths exceeding 800 m (Barnard & Karaman 1991), but in a few cases these amphipods have been reported from subsurface waters, e.g. depths between 200–500 m (Birstein & Vinogradov 1970).

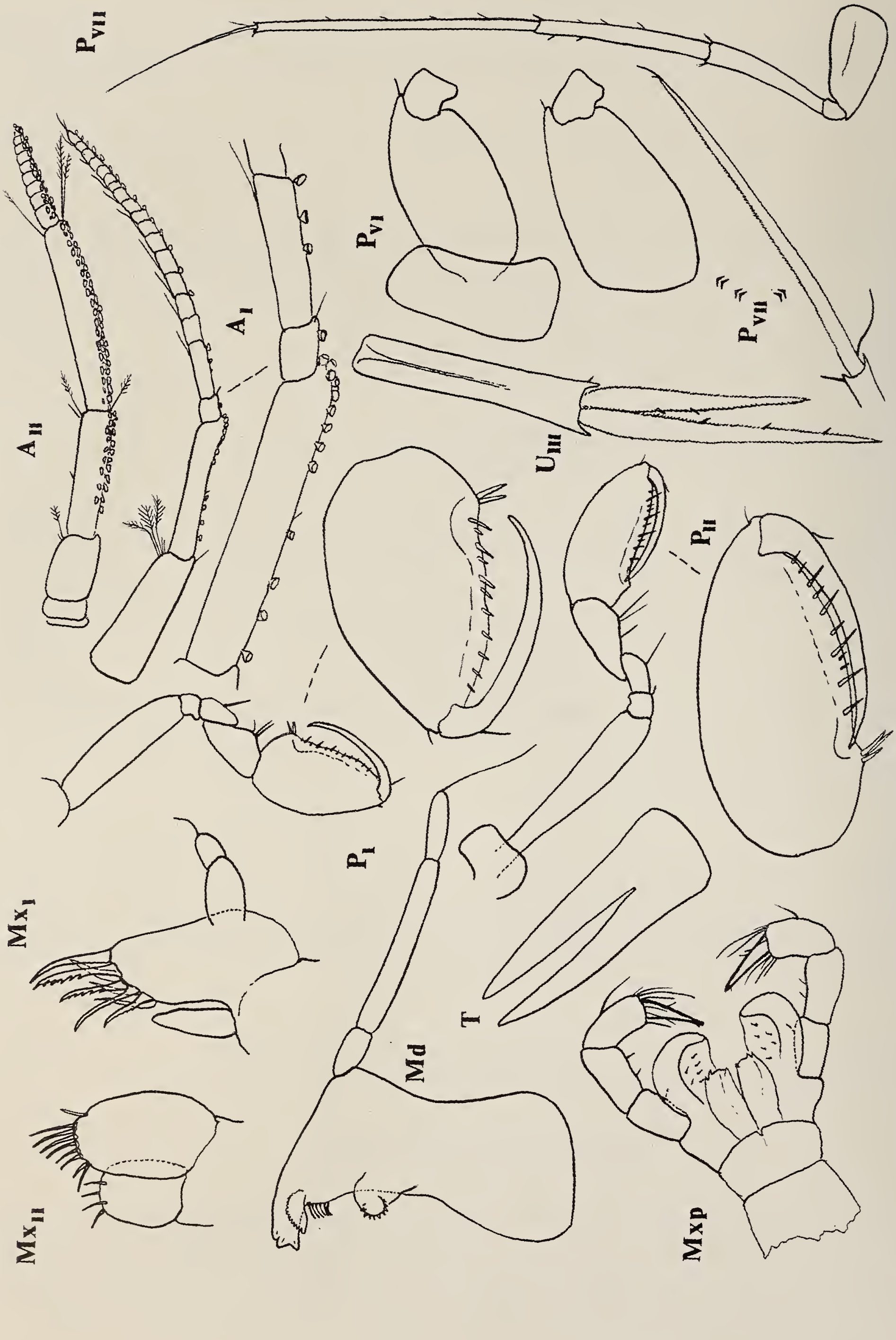

Figure 6
Eusirella ?elegans

Eusirella ?elegans Chevreux, 1908
Fig. 6.

Eusirella elegans Chevreux, 1908: 12; 1935: 103. Shoemaker, 1945: 198 (partim).

Material

TUA 'Sound': st. 2798 (SdM), N, 255–250 m (30 mfb)—2 juv., both 3 mm.

Distribution

North and South Atlantic and western Indian Ocean.

Remarks

The captured amphipods were first juvenile stages. Pereopods I and II had 6th articles particularly short and broad, which is typical of *E. elegans*. They probably belong to this species. However, some differences were also noted: viz. mandibular palp apical article comparatively short and bearing one seta (not two). Maxilliped palp also has noticeably fewer setae than shown by Chevreux's figures. These are interpreted as being merely age-related variability although the possibility that these animals belong to a new species (which is closely related to *E. elegans*) cannot be excluded totally.

Stenopleura Stebbing, 1888

Stenopleura atlantica Stebbing, 1888

Stenopleura atlantica Stebbing, 1888: 950. Stephensen, 1915: 45. Schellenberg, 1926*a*: 353.

Material

IKSAMT: st. 2578 (EM), N, PT 380–400 m—1 specimen, 7 mm; st. 2714 (W), D, NBT 850–650 m—2 specimens, 6 and 6.5 mm. **TUA 'Sound'**: st. 2757 (W), D, 430–530 m (30 mfb)—1 specimen, 5 mm. **BDN 37/50**: st. 2701 (W), D, 750–500 m—1 specimen, 5 mm; ibid., 250–90 m—1 juv., 2 mm; st. 2744 (W), N, 500–250 m—1 ♂, 6.5 mm.

Distribution

Circumtropical.

Remarks

Stenopleura atlantica is normally epipelagic, therefore its capture in closing gear (TUA 'Sound', BDN, but not IKSAMT) at a depth of approximately half a kilometre is worthy of special note.

Stenopleuroides Birstein & M. Vinogradov, 1964

Stenopleuroides macrops Birstein & M. Vinogradov, 1964

Stenopleuroides macrops Birstein & Vinogradov, 1964: 173.

Material

TUA 'Sound': st. 2783 (SdM), D, 262 m (2 mfb)—18 specimens, 2–3 mm; st. 2784 (SdM), D, 263–265 m (30 mfb)—4 specimens, 2–5 mm.

Bottom at st. 2783

Sandy with outcrops of bed rock. Sand with strong ripples; some objects were observed on TV monitor of TUA 'Sound' rolling along the bottom in strong currents.

Distribution

Tropical regions of the Indian Ocean.

Regalia K. Barnard, 1930

Regalia oculata sp. nov.

Figs 7, 8.

Material

IKSAMT: st. 2597 (MC), N, NBT 360–550 m—4 specimens, 7–8.5 (♂) mm (SAM–A40888—SAM–A40891), among them the holotype: ♀ 7 mm (SAM–A40888); st. 2598 (MC), D, PT 400 m—1 juv., 5.5 mm; st. 2799 (SdM), N, NBT 300–220 m—1 ♂, 7 mm (SAM–A40892) and 1 juv., 6 mm. The two last paratypes from stns 2598 and 2799 are stored in the P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences.

Type locality

Mozambique Channel.

Description

Female 7 mm long. Body with strong cuticle. Pereonite VII, pleonites and urosomite I with big knife-like posteriorly turned dorsal teeth, the biggest one on pleonite II. Pleonites with weak lateral teeth too. Urosomite I with depression. Eyes large, with well marked ommatidia, taking up the major part of the lateral cephalic surface, contiguous dorsally. Rostrum well developed, triangular. Lateral cephalic lobe weak.

Antennae of holotype missing, so this description of the antennae is based on paratype material: specimen SAM–A40889 from st. 2799 (male). Antennae I and II subequal. Antenna I peduncle 1st article massive, rectangular, anterior margin with 8 transverse rows of short setae, 1.5 times longer than wide; 2nd article square, with 5 transverse rows

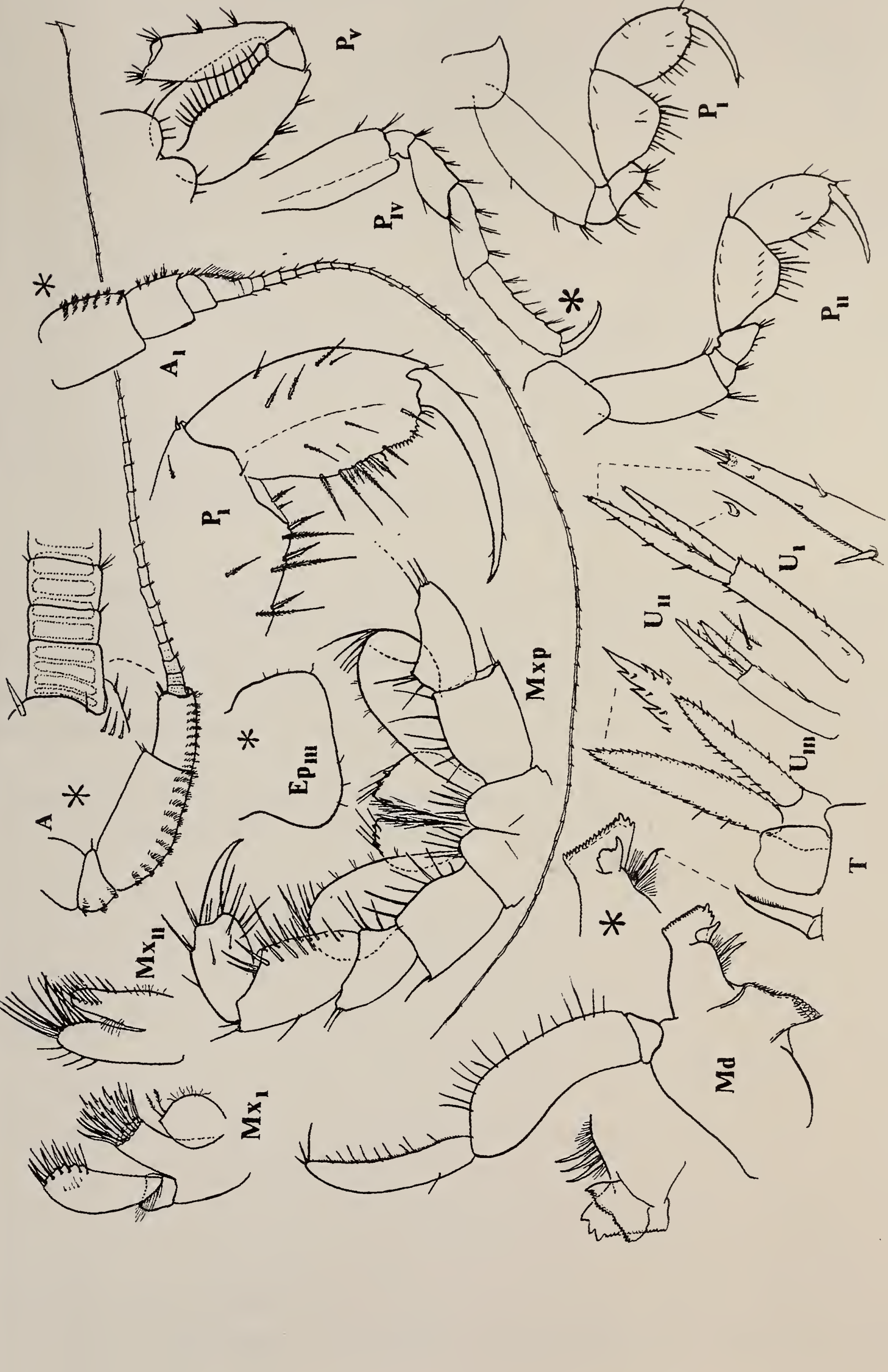

Figure 7

Regalia oculata sp. nov. Holotype and paratype (male, length 7 mm, from st. 2799, marked by *).

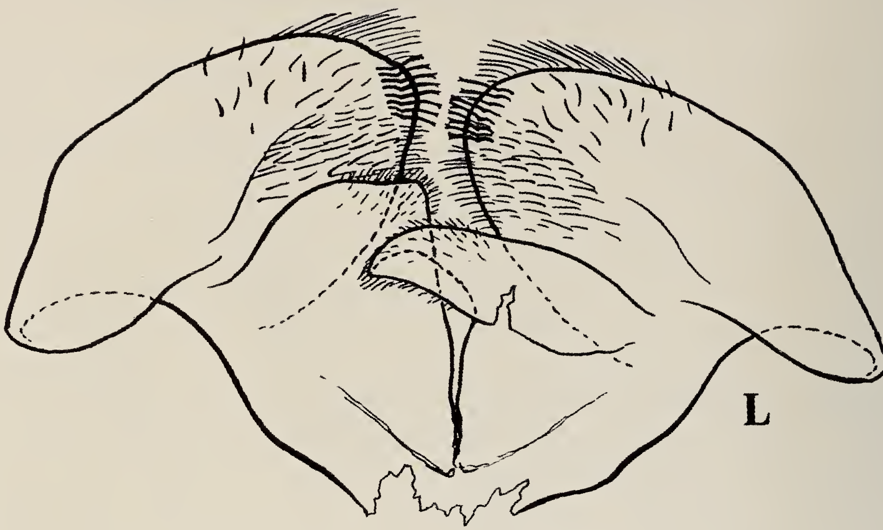

Figure 8
Regalia oculata sp. nov. Paratype (juv., length 5.5 mm, from st. 2598).

of short setae, half as long as 1st; 3rd article short and broad, slightly narrower than 2nd. Flagellum proximal articles merged into a cone, as long as peduncle, covered by weak setae; distal part of flagellum 40-articulate. Accessory flagellum absent. Calceoli absent. Antenna II peduncle articles 1–3 short and broad, 3rd with 4 transverse rows of short setae; 4th article longer than 1–3 combined, rectangular, with 8 transverse rows of short setae; flagellum 40-articulate; calceoli absent.

Lower lip inner lobes well developed, covered by short setules. Outer lobes also covered by short setules, apices have row of strong setae with forked ends. Mandibular processes small, rounded.

Mandible incisor straight, toothed. Right and left laciniae different: right small, with smooth cutting edge and spine-like inner corner; left big, toothed, as broad as incisor, resembling whale's tail in shape. Spiny row of setae and strong spines (2 and 3 on right and left mandibles of holotype respectively, 1 on some paratype mandibles). Molar conical. Palp strong, longer than the total body of mandible, attached on level with molar, 2nd article slightly longer and twice as broad as 3rd.

Maxilla I palp strong, 2-articulate, with strong setae apically. Inner plate shorter than outer, oval, with sharp apex, resembling a lemon in shape, medial margin armed with two subapical pinnate setae. Maxilla II with inner and outer plates subequal, armed by strong setae.

Maxilliped palp strong, armed with numerous setae, greatly exceeding outer plate, dactyl well developed, ordinary, lacking apical nail. Outer plate oval, reaching to middle of palp 2nd article, apex with 4–5 slender spines, medial margin with row of weak setae. Inner plate reaching apex of palp 1st article, distal margin cutting, armed with 3 short blunt spines and 4 long setae, medial margin with numerous weak setae.

Pereopod I coxa small with acute anterodistal corner, 2nd article slender, a little shorter than 5th and 6th taken together, 5th article trapezoid, extended posteriorly with strong pinnate setae on posterior margin, subequal to 6th. Article 6 oval with long pinnate setae on posterior margin, distal part of palm serrated, dactyl about 90 per cent as long as article 6, overreaching palm. Pereopod II like pereopod I, but coxa without acute anterodistal corner.

Pereopods III–IV slender, article 2 of pereopod III expanded distally with small anterodistal lobe; 4th and 5th articles expanded distally, 6th article slender, about 1.5 times as long as article 5.

Pereopods V–VII 2nd articles broad, with prominent posterolateral lobes. On pereopod V this article has a medial carina bearing a row of long setae, 4th articles rather linear. Unfortunately, pereopods V–VII articles 5–7 were missing in all specimens.

Epimeron III posterodistal angle broadly rounded.

Uropod I peduncle subequal to outer ramus, evenly spinose medially, outer ramus with 3–4 marginal and apical spines, inner ramus shorter than outer ramus. Uropod II peduncle about 1.3 times as long as inner ramus, both rami lanceolate, serrated on both margins. Uropod III peduncle much shorter than rami, rami lanceolate, with serrate margins, inner ramus longer than outer ramus.

Telson subquadrate, entire, somewhat overreaching peduncle of uropod III.

Remarks

The scantily known and poorly defined genus *Regalia* includes two species: *R. fasciculares* Barnard, 1930 described from New Zealand and *R. gracilimana* Pirlot, 1934 from Indonesia. The species considered here does not completely satisfy the generic diagnoses, for specimens possess prominent dorsal teeth on pereonite VII as well as on pleon segments. This feature would put it close to *Halirages* if it were not for the absence of calceoli on the antennae. It differs from *Apherusa* by epimeron III posterior margin smooth. An important distinguishing feature of both these genera is the well developed inner lobe of the lower lip. This and many other features testify to this species being a *Regalia*. The only alternative would be to give it the status of a separate genus, but there is little strength in such an argument.

Regalia oculata may be differentiated from other species in the genus by the above-mentioned teeth on pereonal segment VII and by unusually large eyes. In other respects it is very similar to *R. gracilimana*, especially in the morphology of mouthparts, pereopods III and IV, uropods and telson. However, *R. oculata* possesses epimeron III with postero-distal angle rounded and pereopods I and II with relatively shorter and wider articles 5 and 6.

Paramoera Miers, 1875.

Paramoera austrina (Bate, 1862)
Figs 9, 10.

Atylus austrinus Bate, 1862: 137.
Paramoera australis Miers, 1875: 75. Barnard & Karaman, 1991: 332 (in the list).

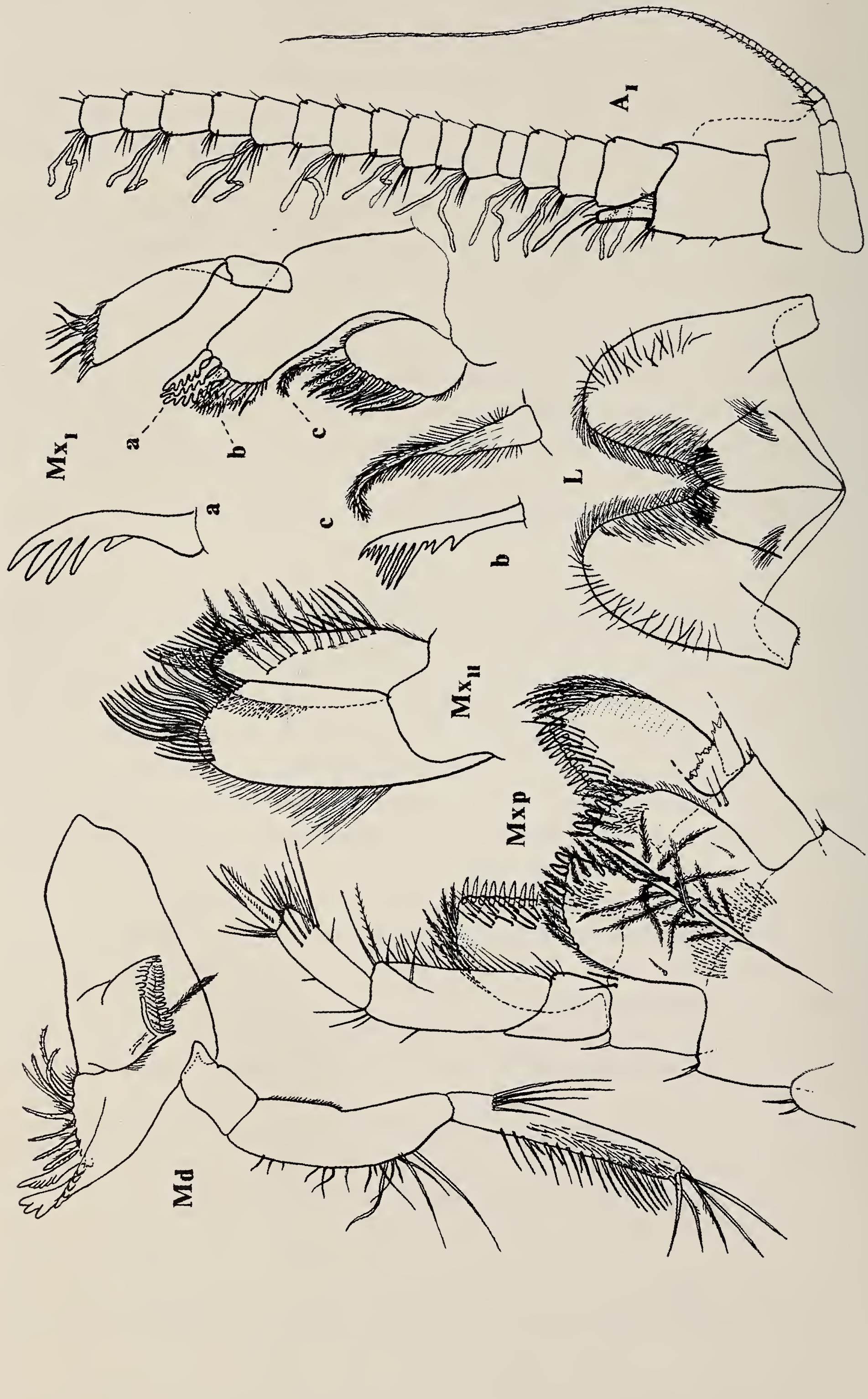

Figure 9
Paramoera austrina, length 6.5 mm. St. 2691, TUA 'Sound' (2 mfb).

Atyloides australis Stebbing, 1888: 914, pts LXXV, LXXVI.
Paramoera austrina Stebbing, 1906: 363. Barnard & Karaman, 1991: 332 (in the list).

Material

TUA 'Sound': st. 2691 (W), N, 28–63 m (2 mfb)—1 specimen, 6.5 mm (SAM–A40893).

Biotope

The bottom was covered with large stones with narrow gaps between them, encrusted by calcareous coralline algae *Mesophyllum syrphetodes* (see also *Biotope* in the description of *Amaryllis maculata* in this article).

Remarks

Our specimen of *P. austrina* conformed to Stebbing's (1888) material, except in a few insignificant details (e.g. pereopods I and II morphology, mandibular palp). However, the drop-like eyes of our specimen are bigger than shown on Stebbing's figures. The eyes take up the majority of the lateral cephalic surface and are nearly contiguous mid-dorsally.

Distribution

South Indian and south Indo-Pacific Oceans.

DISCUSSION

Thirty-four gammaridean species are represented in our material. The overwhelming majority of pelagic gammaridean species are deep-water bathy- and abyssopelagic animals. This explains the paucity of Gammaridea in our epi- and mesopelagic water samples.

Typically epipelagic gammaridean species are few; three of them (*Eusiropsis rissoei*, *Stenopleura atlantica* and *Synopia variabilis*) were found in our material.

The two species of *Trischizostoma*, as has already been pointed out, are ectoparasites of near-bottom sharks which are a consistent element of the fauna of the investigated regions.

Paracyphocaris praedator appears not to be a parasite of sharks, but of large planktonic crustaceans. In addition, *Thoriella islandica* and probably *Parandania boecki,* are parasites/predators of gelatinous zooplankters (Vinogradov 1988; Moore & Rainbow 1989; Coleman 1990).

The remaining 26 species can be categorized into two groups: typical inhabitants of the meso- and bathypelagic zones (it is thought that some of them are able to collect prey from the bottom) and benthic animals only sporadically rising into the pelagial.

Almost all the representatives of the first group are panoceanic species: only *Cyphocaris cornuta* has not been found beyond the waters of the Mozambique Channel. In the IKSAMT samples three species (*Cyphocaris anonyx*, *C. challengeri* and *Bathystegocephalus globosus*) were found in great quantities and amounted to 2.6, 7.5 and

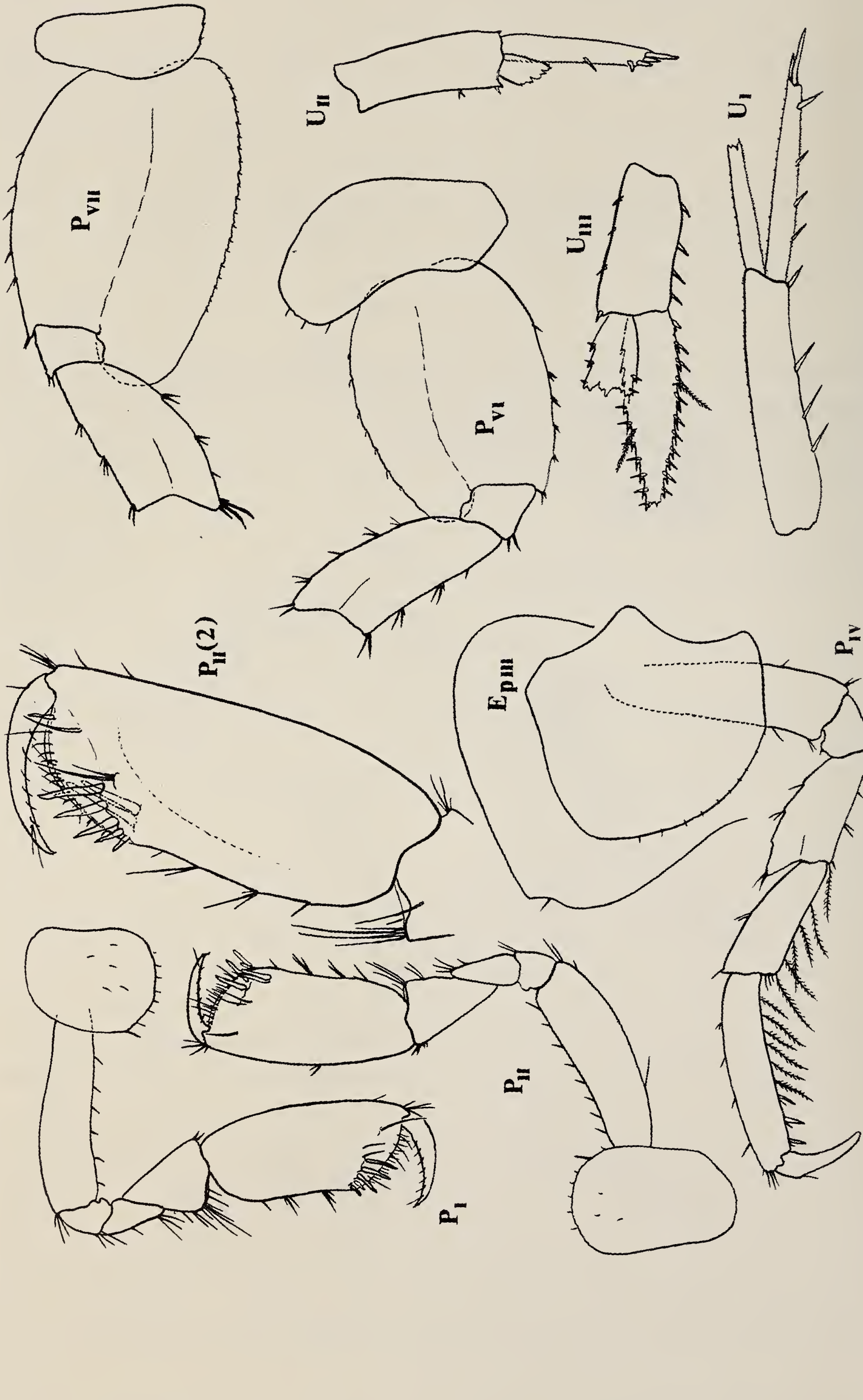

Figure 10
Paramoera austrina, length 6.5 mm. St. 2691, TUA 'Sound' (2 mfb).

79.3 per cent (respectively) of all amphipods so caught. That said, a considerable proportion of *B. globosus* was caught as a result of near-bottom trawling, as will be discussed below.

Comparison of the IKSAMT near-bottom and pelagic samples permits detection of that group of animals which is largely specific to the near-bottom layer of water. Some animals were only recorded (practically) in the near-bottom catches: *Trischizostoma tanjae* (155 out of 156 specimens, recorded in all samples), *Ichnopus pelagicus* (22 out of 24 recorded specimens) and *Regalia oculata* sp. nov. (6 out of 7 recorded specimens). Of these *T. tanjae*, as already indicated, is most likely a parasite of near-bottom sharks, which determines its concentration in this layer. The other two species are free-living animals.

In addition, *Amaryllis maculata* sp. nov., *Erikus dahli*, *Thoriella islandica* and *Halice tenella* were recorded only in the IKSAMT near-bottom samples. However, these species were represented only by single specimens, which does not permit us to derive any conclusions from these results, especially since all that is known about *T. islandica* and *H. tenella* testifies to the fact that these amphipods were most likely caught during passage of the trawl through the water column.

Bathystegocephalus globosus deserves special mention. This species was regularly (15 times) recorded in the IKSAMT samples; however, its largest numbers were yielded by three near-bottom catches: 242, 1 368 and 18 specimens (out of a total of 1 815 specimens recorded in all catches). Pelagic catches of *B. globosus* were recorded predominantly at night-time (animals were recorded only twice in daytime pelagic samples and in both cases depths exceeding 500 m were being sampled at the time); and most abundant near-bottom trawlings were carried out during the daytime (the richest haul was at a depth of only 200 m). It is possible that *B. globosus* makes active diurnal migrations. At night it may be distributed in the water column and so not abundant in the trawl samples (rarely exceeding 10 specimens per catch). In the daytime the population descends and, if a submerged seamount exceeds this depth, these amphipods accumulate over it. An analogous situation was observed with *Cyphocaris challengeri* over the submerged Nazka and Sala-y-Gomez ridges in the Pacific Ocean (Vinogradov 1990*b*).

Only six gammarideans from five species were found in all the lower (nearest to bottom) plankton net hauls (with lower limit 50 mfb). The TUA 'Sound' catches at 30 mfb yielded 20 gammarideans from 12 species (in 11 from 13 received samples) and 40 gammarideans from 11 species at 2 mfb (in 13 from 35 received samples). Thus, the number of gammarideans increases as one approaches the bottom. The true pelagic amphipods were scare in these samples, the majority were near-bottom and benthopelagic species and benthic migrants. That said, the purely pelagic species were caught in the main at 30 mfb, and benthopelagic and near-bottom gammarideans at 2 mfb (Table 1). *Stenopleuroides macrops* was the only exception to this pattern, 18 out of 22 captured species of this animal were taken at 2 mfb. However, it should be noted that 18 *S. macrops* were caught from one haul (st. 2783, 2 mfb) which may have encompassed a 'swarm'. It is interesting that the opposite pattern, i.e. a sharp decrease in the number of animals on approaching the bottom, appears for the purely pelagic hyperiids and other big planktonic crustaceans on the basis of other results of the same samples (Vinogradov 1990*a*;

Vereshchaka 1990). We observe here one of the specific characteristics of the thin water layer directly overlying the bottom, i.e. a change from the purely pelagic animals to the representatives of the near-bottom plankton.

Comparison of the gammarideans caught by TUA 'Sound' with the other material permits detection of one more group of gammarideans caught only in the near-bottom layer (Table 1, indicated by asterisks). It includes all the benthopelagic and swimming benthic amphipods caught by TUA (except one specimen of *Halicoides discoveryi* and two specimens of *Stegocephaloides attingens* which were also found in the near-bottom catches by the Juday nets covering the 50–250 mfb layer), as well as three species of the typically pelagic amphipods (*Eusirella elegans*, *Stenopleuroides macrops* and *Halice macronyx*). Of the latter, *H. macronyx* and *E. elegans* are rare amphipods represented by one and two specimens (respectively) in the entire sample. Their capture near the bottom is most likely accidental. As for *S. macrops,* it was found in abundance, but only in one place above 300 m depths on the Saya de Malha Bank (12°26–27'S, 61°04'E). Unfortunately pelagic trawling was not carried out at this station, so we have no data on the vertical distribution of this species. Previously, *S. macrops* was recorded in pelagic samples from the upper 300 m layer over depths of 3–4 km (Birstein and Vinogradov 1964).

No significant difference between the number of gammarideans caught during the day or night using TUA 'Sound' has been detected.

TABLE A

IKSAMT station data (stations lacking Gammaridea excluded) 10°25' N

Station No	Date	Local time of trawling	Depth of bottom (m)	Depth of trawling (m)	Location (start point of trawling)	
Error Mountain						
2575	30.X.1988	16.00–17.20	400–1100	380–400	10°18' N	56°06' E
2576	30.X.1988	17.50–18.25	>2000	50–0	10°25' N	56°06' E
2578	31.X.1988	01.45–02.45	1280–1050	380–400	10°18' N	56°17' E
Mozambique Channel						
2597	12.XI.1988	02.35–03.55	390–560	360–550	10°29' S	48°20' E
2598	12.XI.1988	05.15–06.15	560–820	400	12°36' S	48°11' E
2604	13.XI.1988	02.45–03.40	695–690	680	12°31' S	48°09' E
2605	13.XI.1988	11.00–12.30	1100–970	460–700	12°52' S	48°01' E
2616	18.XI.1988	01.45–04.47	3100–3000	1700–1900	15°05' S	42°16' E
2625	22.XI.1988	01.23–02.23	220–230	210–220	24°30' S	35°30' E
2642	28.XI.1988	19.30–21.00	1700–2120	1200	23°21' S	43°23' E
2667	06.XII.1988	17.40–19.00	1900	(100)–200	27°59' S	44°33' E

Station No	Date	Local time of trawling	Depth of bottom (m)	Depth of trawling (m)	Location (start point of trawling)	
Walters Shoal						
2675	10.XII.1988	03.21–04.21	1600–1320	1000	32°54' S	45°23' E
2689	12.XII.1988	16.45–18.38	250–600	0–500–0	33°16' S	43°50' E
2712	16.XII.1988	00.22–01.22	550–600	100	33°08' S	43°59' E
2713	16.XII.1988	02.10–03.00	650	200	33°12' S	43°59' E
2714	16.XII.1988	05.20–06.35	850–790	850–650	33°22' S	43°51' E
2717	16.XII.1988	22.40–23.30	2400	1000	34°06' S	43°45' E
2718	17.XII.1988	01.10–02.10	2400	100	34°00' S	43°45' E
2719	17.XII.1988	03.10–04.13	2200–1600	200	33°55' S	43°46' E
2720	17.XII.1988	05.30–06.45	1600–2000	850–730	33°50' S	43°47' E
2725	18.XII.1988	00.17–01.17	50–30	20	33°11' S	43°52' E
2726	18.XII.1988	01.51–02.51	220–750	100	33°16' S	43°54' E
2727	18.XII.1988	03.30–04.30	750–920	200–150	33°24' S	43°56' E
2729	18.XII.1988	07.25–08.25	1150–1580	620–660	33°33' S	43°55' E
2773	25.XII.1988	19.21–20.21	2040–2100	1150	31°25' S	45°56' E
2775	25.XII.1988	22.36–23.36	2150–2200	100	31°17' S	46°09' E
2776	26.XII.1988	00.08–01.08	2200	200	31°13' S	46°12' E
2777	26.XII.1988	02.00–03.00	2200	550	31°08' S	46°15' E
Saya de Malha Bank						
2785	05.I.1989	20.20–21.20	1600–1900	600	12°22' S	60°49' E
2787	05–06.I.89	23.17–00.17	1900–2200	100	12°13' S	60°41' E
2788	06.I.1989	01.08–02.08	2200–2000	400	12°09' S	60°40' E
2789	06.I.1989	03.58–04.58	2000–2115	970–1020	12°03' S	60°38' E
2794	06.I.1989	15.00–16.00	303–700	300–330	11°49' S	60°58' E
2799	06–07.I.89	23.50–00.50	310–220	300–220	11°49' S	61°00' E
2800	07.I.1989	01.43–02.43	250	200	11°45' S	61°05' E
2801	07.I.1989	03.12–03.42	250–238	50	11°41' S	61°09' E
2805	07.I.1989	15.57–17.00	240–223	230–200	11°12' S	62°11' E
2807	08.I.1989	02.35–03.35	215–190	210–185	11°08' S	62°12' E
Error Mountain (second visit)						
2823	14.I.1989	15.55–16.55	390–432	380–400	10°19' N	56°06' E
2826	14.I.1989	21.20–22.20	400	390–370	10°18' N	56°04' E
2827	15.I.1989	00.00–01.00	2000	370	10°22' N	56°04' E

TABLE B

TUA 'Sound' station data (stations lacking Gammaridea excluded)

Station No	Date	Local time of sampling	Depth of bottom (m)	Location (start point of catching)	
Mozambique Channel					
2624	21–22.XI.1988	23.45–00.15	220–220	24°31' S	35°28' E
2635	25.XI.1988	14.01–14.30	223–223	25°11' S	35°13' E
2637	26.XI.1988	02.13–04.30	975–910	25°18' S	35°24' E
2647	2.XII.1988	19.08–21.08	404–521	22°17' S	43°04' E
2649	3.XII.1988	01.06–03.06	965–950	22°22' S	43°00' E
2655	3.XII.1988	19.17–21.17	1215–1240	22°26' S	42°53' E
2660	4.XII.1988	10.14–10.44	135–80	22°12' S	43°09' E
2661	4.XII.1988	11.30–12.30	312–180	22°13' S	43°07' E
Walters Shoal					
2676	10.XII.1988	09.15–11.15	1060–1070	32°55' S	44°39' E
2678	10.XII.1988	18.23–20.23	850–790	33°03' S	44°12' E
2681	11.XII.1988	01.55–03.55	510–340	33°09' S	43°58' E
2691	12–13.XII.88	23.40–00.40	46–30–76	33°09' S	43°53' E
2709	15.XII.1988	18.08–20.08	455–590	33°09' S	43°58' E
2737	19.XII.1988	14.50–16.50	1100–1113	33°58' S	45°04' E
2746	21.XII.1988	07.20–09.20	980–950	33°47' S	44°35' E
2757	23.XII.1988	05.35–07.35	485–560	33°15' S	43°57' E
Saya de Malha Bank					
2783	5.I.1989	14.54–15.54	265	12°26' S	61°04' E
2784	5.I.1989	16.45–17.15	268–275	12°27' S	61°04' E
2792	6.I.1989	12.10–12.40	296	11°49' S	61°00' E
2797	6.I.1989	20.57–21.27	250–260	11°46' S	60°59' E
2798	6.I.1989	21.43–22.13	260–285	11°47' S	61°00' E

TABLE C

BDN station data (stations lacking Gammaridea excluded)

Station No	Date	Local time of sampling	Haul (m)	Depth of bottom (m)	Location	
2701	14.XII.1988	15.05–15.40	750–500	820	33°03' S	44°05' E
"		16.15–16.22	250–90			
2710	15.XII.1988	21.30–22.10	450–240	500	33°07' S	43°56' E
2740	19.XII.1988	20.30–20.50	250–100	990	33°55' S	44°55' E
2744	21.XII.1988	03.55–04.50	920–500	970	33°47' S	44°35' E
"		04.55–05.25	500–250			
2758	23.XII.1988	08.53–09.20	500–250	550	33°17' S	43°56' E

TABLE D

ODN station data (stations lacking Gammaridea excluded)

Station No	Date	Local time of sampling	Haul (m)	Depth of bottom (m)	Location	
2586	03.XI.1988	03.15–03.45	500–250	750	00°27' N	56°03' E
2648	02.XII.1988	21.45–22.10	450–250	520	22°21' S	43°04' E
2656	03.XII.1988	21.17–22.55	1000–500	1270	22°20' S	42°54' E

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REFERENCES

ANDRES H.G. 1981. Lysianassidae aus dem Abyssal des Roten Meers. Bearbeitung der Koderfange von F S 'Sonne'–MESEDA I (1977) (Crustacea: Amphipoda: Gammaridea). *Senckenbergiana Biologia.* **61** (5-6): 429–43.

BALDWIN, R.J. & SMITH, K.L. 1987. Temporal variation in the catch rate, length, color and sex of the necrophagous amphipod *Eurythenes gryllus* from the central and eastern North Pacific. *Deep-Sea Research* **34** (3): 425–39.

BARNARD, J.L. 1961. Gammaridean Amphipoda from depths of 400 to 6 000 metres. *Galathea Report* **5**: 23–120.

BARNARD, J.L. 1964. Marine amphipoda of Bahia de San Quintin, Baja California. *Pacific Naturalist* **4** (3): 55–139.

BARNARD, J.L. 1965. Marine amphipoda of atolls in Micronesia. *Proceedings of the United States National Museum* **117** (3516): 459–552.

BARNARD, J.L. 1969. The families and genera of marine gammaridean Amphipoda. *Bulletin. United States National Museum* **271**: 1–535.

BARNARD, J.L. 1972. Gammaridean Amphipoda of Australia. Part I. *Smithsonian Contributions to Zoology* **133**: 1–333.

BARNARD, J.L. & KARAMAN, G. S. 1991. The families and genera of the marine gammaridean Amphipoda (except marine Gammaroids). Parts 1 and 2. *Records of the Australian Museum* Supplement **13**: 1–866.

BARNARD, K.H. 1916. Contributions to the crustacean fauna of South Africa, 5: The Amphipoda. *Annals of the South African Museum* **15**: 105–302.

BARNARD, K.H. 1925. Contributions to the crustacean fauna of South Africa, 8: Further addition to the list of Amphipoda. *Annals of the South African Museum* **20**: 319–80.

BARNARD, K.H. 1930. Amphipoda: British Antarctic ('Terra Nova') Expedition, 1910. *British Museum (Natural History). Rep. Zool.* **8**: 307–454.

BARNARD, K.H. 1932. Amphipoda. *'Discovery' Report* **5**: 1–326.

BATE, C.S. 1856. On the British Edriophthalma. *Report on the Twenty-Fifth meeting of the British Association for the Advancement of Science 1855.* pp 18–62.

BATE, C.S. 1857. A synopsis of the British edriophthalmous Crustacea. *Annals and Magazine of Natural History* (series 2) **19**: 135–52.

BATE, C.S. 1862. *Catalogue of the specimens of amphipodous Crustacea in the collection of the British Museum.* London: British Museum of Natural History.

BIRSTEIN, J.A. & VINOGRADOV, M.E. 1955. The pelagic gammarids of the Kurile-Kamchatka trench. *Trudy Instituta Okeanologii AN SSSR* [*Trans. P.P. Shirshov Inst. of Oceanology Ac. Sci., USSR*] **12**: 210–87. (In Russian).

BIRSTEIN, J.A. & VINOGRADOV, M.E. 1958. The pelagic gammarids (Amphipoda, Gammaridea) of the northwest part of the Pacific Ocean. *Trudy Instituta Okeanologii AN SSSR* [*Trans. P.P. Shirshov Inst. of Oceanology Ac. Sci., USSR*] **27**: 219–57. (In Russian).

BIRSTEIN, J.A. & VINOGRADOV, M.E. 1960. The pelagic gammarids from the tropical Pacific. *Trudy Instituta Okeanologii AN SSSR* [*Trans. P.P. Shirshov Inst. of Oceanology Ac. Sci. USSR*] **34**: 165–241. (In Russian).

BIRSTEIN, J.A. & VINOGRADOV, M.E. 1962. Pelagic gammarids collected by the Soviet Antarctic Expedition with the R/V *Ob* southward from the 40°S. *Explorations of the fauna of the seas. I(IX): Biological results of the Soviet Antarctic Expedition (1955–1958)* **1**: 36–57. (In Russian).

BIRSTEIN, J.A. & VINOGRADOV, M.E. 1964. The pelagic amphipod gammarids of the northern part of the Indian Ocean. *Trudy Instituta Okeanologii AN SSSR* [*Trans. P.P. Shirshov Inst. of Oceanology Ac. Sci. USSR*] **65**: 152–96. (In Russian).

BIRSTEIN, J.A. & VINOGRADOV, M.E. 1970. On the fauna of pelagic gammarids of the Kurile-Kamchatka region of the Pacific Ocean. *Trudy Instituta Okeanologii AN SSSR* [*Trans. P.P. Shirshov Inst. of Oceanology Ac. Sci. USSR*] **86**: 401–19. (In Russian).

BIRYUKOV, S.G., MARYATKIN, V.N., MATVEEV, A.S., POPOV, V.A. & RUDJAKOV, J.A. 1990. Experience of usage of towed underwater apparatus 'Sound' for study of near-bottom plankton. *Okeanologija* [*Oceanology (Moscow)*] **30** (1): 152–6. (In Russian).

BOECK, A. 1861. Bemaerkninger angaaende de ved de norske kyster forekkomende Amphipoder. *Førhandl. Scand. Naturforsk., Ottende Möde* **8**: 631–77.

BOECK, A. 1871. Crustacea Amphipoda borealia & arctica. *Førhandl. Vidensk.-Selsk. Christiania 1870.* S. 83–280.

BOECK, A. 1872. Bidrag til Californiens Amphipoden fauna. *Førhandl. Vidensk.-Selsk. Christiania 1871.* S. 1–22.

BOWMAN, T.E. & WASMER, T.A. 1984. The deep-sea amphipod *Paracyphocaris praedator* (Gammaridea : Lysianassidae) associated with the pelagic shrimp *Oplophorus novaezeelandie* as an egg-mimic. *Proceedings of the Biological Society of Washington* **97** (4): 844–8.

CHEVREUX, E. 1900. Amphipodes provenant des campagnes de l'Hirondelle (1885–1888). *Résultats des campagnes scientifique par le Prince Albert I* **16**: 1–195.

CHEVREUX, E. 1905*a*. Description d'un amphipode (*Cyphocaris richardi* nov. sp.) provenant des pêches au filet a grande ouverture de la dernière campagne du yacht Princesse-Alice (1904). *Bulletin du Musée oceanographique de Monaco* **24**: 1–5.

CHEVREUX, E. 1905*b*. *Cyphocaris alicei*, nouvelle espèce d'Amphipode voisine de *Cyphocaris challengeri* Stebbing. *Bulletin du Musée oceanographique de Monaco* **27**: 1–6.

CHEVREUX, E. 1905*c*. *Paracyphocaris praedator*, type d'un nouveau genre de Lysianassidae. *Bulletin du Musée oceanographique de Monaco* **32**: 1–5.

CHEVREUX, E. 1905*d*. Description d'un Amphipode (*Katius obesus*, nov. gen. & sp.). Suivie d'une liste des Amphipodes de la tribu des Gammarina ramenés par le filet à grande ouverture pendant la dernière campagne de la Princesse-Alice en 1904. *Bulletin du Musée oceanographique de Monaco* **35**: 1–5.

CHEVREUX, E. 1908. Diagnoses d'amphipodes nouveaux provenant des campagnes de la Princesse-Alice dans l'Atlantique nord. *Bulletin du Musée oceanographique de Monaco* **121**: 1–15.

CHEVREUX, E. 1935. Amphipodes provenant des campagnes du Prince Albert I-er, de Monaco. *Résultats des campagnes scientifique par le Prince Albert I* **90**: 1–214.

CHILTON, C. 1912. The Amphipoda of the Scottish National Antarctic Expedition. *Transactions of the Royal Society of Edinburgh* **48**: 455–520.

COLEMAN, Ch.O. 1990. Anatomy of the alimentary canal of *Parandania boecki* (Stebbing, 1888) (Crustacea, Amphipoda, Stegocephalidae) from the Antarctic ocean. *Journal of Natural History, London* **24**: 1573–85.

COLLET, B.D. & PARIN, N.V. 1991. Shallow-water fishes of Walters Shoal, Madagascar Ridge. *Bulletin of Marine Science* **48** (1): 1–22.

COSTA, A. 1853. Relazione sulla memoria del Dottor Achille Costa, di ricerche su' crostacei amfipodi del regno di Napoli. *Rendiconto della Societa Reale Borbonica, Accademia delle Scienze* (new series) **2**: 167–78.

DANA, J.D. 1852. On the classification of the crustacean Choristopoda or Tetradecapoda. *American Journal of Science and Arts* (series 2) **14** (Appendix): 297–316.

DELLA VALLE, A. 1893. Gammarini del Golfo di Napoli. *Fauna und Flora des Golfes von Neapel und der angrenzenden Meers-Abschnitte. Monographie* **20**. 948 p., atlas (Atlante) 61 pls.

GILES, G.M. 1890. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator", Commander Alfred Carpenter, R.N., D.S.O., commanding. No. 15. Descriptions of seven additional new Indian amphipods. *Journal of the Asiatic Society of Bengal* **59** (2): 63–74.

GURJANOVA, E.F. 1951. *The Amphipoda of the seas of USSR with adjacent waters.* Moscow & Leningrad: Izd. AN SSSR. 1032 pp (in Russian).

GURJANOVA, E.F. 1962. Gammarideans of the northern Pacific Ocean (Amphipoda–Gammaridea). Part I. Moscow & Leningrad, Izd. AN SSSR. pp 1–441 (in Russian).

HASWELL, W.A. 1879. On Australian Amphipoda. *Proceedings of the Linnean Society of New South Wales* **4** (3): 245–79.

HASWELL, W.A. 1882. *Catalogue of the Australian stalk- and sessile-eyed Crustacea.* Sydney: F.W. White. 327 pp.

KAIM-MALKA, R.A. 1969. Biologie & ecologie de quelques *Ampelisca* (Crustacea, Amphipoda) de la région de Marseille. *Tethys* **4** (11): 977–1022.

KARAMAN, G.S. 1974. Revision of the family Pardaliscidae with diagnoses of genera, distribution of species and bibliography. *Acta Adriatica* **15** (7): 3–46.

KRÖYER, H. 1845. Karcinologiske Bidrag. *Naturh. Tidsskr, NR.* **1**: 283–345, 403, 453–638.

LEDOYER, M. 1978. Contribution á l'étude des amphipodes gammariens profonds de Madagascar. *Tethys* **8** (4): 365–82.

LEDOYER, M. 1986. Crustacés Amphipodes Gammariens. Families des Haustoridae à Vitjazianidae. *Faune de Madagaskar* **59** (2): 599–1112.

LICHTENSTEIN, H. *In*: MANDT, M.W. 1822. Observationes in historian naturalen & anatomian comparant in itinere Groenlandico factae. – Dissertatio inauguralis quam consensu & auctoritaegratiosi micoruminauguralis quam consensu & auctoritategratiosi micorum ordinis in universitate literaria berolinensi ut summi in medicina & chirurgia honores rite sibi concedantur die XXII. Berolini. Publice defendet auctor Martinus Gulielmus Mandt Beyenburgensis. pp 31–7.

LILJEBORG, W. 1855. Om Hafs-Crustacee vid Kullaberg i Skane. *Öfversigt af Kongliga Vetensk.-Akad. Förhandl.* **12**: 117–38.

LILJEBORG, W. 1865. On the *Lysianassa magellanica* H. Milne Edwards, and on the Crustacea of the suborder Amphipoda and subfamily Lysianassina found on the coast of Sweden and Norway. *N. Acta Reg. Soc. Sci. Upsal., (*series 3) **6** (1): 1–38.

LOWRY, J.K. & STODDART, H.E. 1987. A new South American genus and species in the amaryllidid group of lysianassoid Amphipoda. *Journal of Natural History* **12**: 1303–9.

LOWRY, J.K. & STODDART, H.E. 1992. A revision of the genus *Ichnopus* (Crustacea: Amphipoda: Lysianassoidea: Uristidae). *Records of the Australian Museum* **44**: 185–245.

LOWRY, J.K. & STODDART, H.E. 1993. Crustacea amphipoda: lysianassoids from Philippine and Indonesian waters. *In*: CROSNIER, A. *ed*. Résultats des Campagnes MUSORSTOM, Volume 10. *Mémoires du Muséum nationale d'histoire naturelle* **156**: 55–109.

LOWRY, J.K. & STODDART, H.E. 1994. Crustacea amphipoda: lysianassoids from the tropical western South Pacific Ocean. *In*: CROSNIER, A. *ed*. Résultats des Campagnes MUSORSTOM, Volume 12. *Mémoires du Muséum nationale d'histoire naturelle* **161**: 127–223.

MACQUART-MOULIN, C. 1968. Les amphipodes bentho-planctoniques du Golf de Marseille: analyse des captures faites au cours de pêches planctoniques nocturnes régulières (Années 1963–1964). *Rec. Trav. St. Mar. D'Endoume.* **43** (59): 311–32.

MACQUART-MOULIN C., BOURDILLON A., PASSELAIGUE F. & RASOANARIVO R. 1987. Un cas type de migration verticale "retare" chez l'amphipode *Ampelisca typica*. *Journal of Plankton Research* **9** (5): 785–809.

MIERS, E.J. 1875. Descriptions of new species of Crustacea collected at Kerguelen's Island by the Rev. A. E. Eaton. *Annals and Magazine of Natural History* (series 4) **16**: 73–6.

MILLS, E.L. 1967. The biology of an ampeliscid amphipod crustacean sibling species pair. *Journal of the Fisheries Research Board of Canada* **24**: 305–55.

MILNE EDWARDS, H. 1848. Sur un crustace amphipode, remarquable par sa grande taille. *Annales de Sciences naturelles* Zoologie *(*series 3) **9**: 398.

MOORE, P.G. & RAINBOW, P.S. 1989. Feeding biology of the mesopelagic gammaridean amphipod *Parandania boecki* (Stebbing, 1888) (Crustacea: Amphipoda: Stegocephalidae) from the Atlantic Ocean. *Ophelia* **30**: 1–19.

PIRLOT J.-M. 1933. Les amphipodes de l'expédition du Siboga, Deuxième partie: Les amphipodes gammarides, II: Les amphipodes de la mer profonde. 1: (Lysianassidae, Stegocephalidae, Stenothoidae, Pleustidae, Lepechinellidae). *Siboga Expeditie* **33c**: 115–66.

PIRLOT J.-M. 1934. Les amphipodes de l'expédition du Siboga, Deuxième partie: Les amphipodes gammarides, II: Les amphipodes de la mer profonde. 2: (Hyperiopsidae, Pardaliscidae, Astyridae nov. fam., Tironidae, Calliopiidae, Paramphithoidae, Amathillopsidae nov. fam., Eusiridae, Gammaridae, Aoridae, Photidae, Amphithoidae, Jassidae). *Siboga Expeditie* **33*d***: 167–235.

REID, D.M. 1951. Report on the Amphipoda (Gammaridea and Caprellidea) of the coast of tropical West Africa. *Atlantide Report* **2**: 189–291.

RUDJAKOV, J.A. & ZAIKIN, A.N. 1990. 18th cruise of R/V 'Professor Stockman': a next step of hydrobiological investigations of the ocean near-bottom layer. *Trudy Instituta Okeanologii AN SSSR* [*Trans. P.P. Shirshov Inst. of Oceanology Ac. Sci. USSR*] **124**: 7–14. (In Russian).

SARS, G.O. 1891–1895. Amphipoda. *An account of the Crustacea of Norway with short description and figures of all the species.* **1**: 1–711, 240 + 8 pls.

SCHELLENBERG, A. 1925. Crustacea VIII: Amphipoda, volume 3. *In*: W. MICHAELSEN [Ed.]. Beiträge zur Kenntnis der Meersfauna Westafrikas. Hamburg: L. Friedrichsohn & K.P. 111–204.

SCHELLENBERG, A. 1926*a*. Amphipoda 3: Die Gammariden der Deutchen Tiefsee Expedition. *Wissenschaftliche Ergebnisse der Deutchen Tiefsee-Expedition auf dem Dampfer 'Valdivia' 1898–1899.* **23** (5): 195–243.

SCHELLENBERG, A. 1926*b*. Die Gammariden. *Deutche Südpolar-Expedition, 1901–1903* **18**: 235–414.

SCHELLENBERG, A. 1955. Amphipoda. *Report of the Swedish Deep-sea Expedition* (ser. Zool.) **2** (18): 181–95.

SCHERBATCHEV, Yu.N. 1989. The report of the ichthyological team. *In*: *Report of the 17th cruise of R/V 'Vityaz' to the west part of the Indian Ocean according to the "Ecosystem" project*: 177–248. Moscow: P.P. Shirshov Inst. of Oceanol. Acad. Sci. USSR. (In Russian).

SHOEMAKER, C.R. 1945. The Amphipoda of the Bermuda Oceanographic Expeditions, 1929–1931. *Zoologica. Scientific Contributions of the New York Zoological Society* **30** (4): 186–264.

SHOEMAKER, C.R. 1956. Notes on the amphipods *Eurythenes gryllus* (Lichtenstein) and *Katius obesus* Chevreux. *Proceedings of the Biological Society of Washington* **69**: 177–8.

SMITH, S.I. *In*: SCUDDER, S.H. 1882. *Nomenclator zoologicus: An alphabetical list of all generic names that have been employed by naturalists for recent and fossil animals from the earliest times to the close of the year 1879. II. Universal Index.* Washington.

SMITH, S.I. 1884. Crustacea of the "Albatross" dredgings in 1883. *American Journal of Science* (series 3) **28**: 53–6.

SPANDL, H. 1923 Amphipoden der 'Pola'-Expeditionen in das Rote Meer. *Sitzber. Akad. Wiss. Wien, Anzeiger, 60 Jahrgang, 1923 [part 1].* S. 17–20.

SPANDL, H. 1924. Die Amphipoden des Roten Meers. *In:* Expeditionen S.M. Schiff "Pola" in das Rote Meer nördliche und südliche hälfte 1895/96–1897/98. *Zool. Ergebn. 35, Denk. Akad. Wiss. Wien Mat.* **99**: 19–73.

STEBBING, T.R.R. 1888. Report on the Amphipoda collected by H.M.S. 'Challenger' during the years 1873–1876. *Report of the Scientific Results of the Voyage of H.M.S. 'Challenger' 1873–76* **29**: 1–1737.

STEBBING, T.R.R. 1897. Amphipoda from the Copenhagen Museum and other sources. Part II. *Transactions of the Linnean Society of London* (series 2, Zoology) **7**: 25–45.

STEBBING, T.R.R. 1906. Amphipoda. I. Gammaridea. *Tierreich* (B) **21**: 1–806.

STEPHENSEN, K. 1915. Isopoda, Tanaidacea, Cumacea, Amphipoda (exl. Hyperiidea). *Report on the Danish Oceanographical Expeditions, 1908–1910 to the Mediterranean and adjacent seas. 2. Biology. D. 1915.* **1**: 1–53.

STEPHENSEN, K. 1933. Amphipoda. The 'Godthaab' expedition 1928. *Meddelelser om Grønland* **79** (7): 1–88.

STEPHENSEN, K. 1935. The Amphipoda of N. Norway and Spitsbergen with adjacent waters. *Tromsø museum skrifter* **3** (1): 1–140.

STRAUSS, E. 1909. Das Gammaridenauge. Studien über ansgebildete und rückgebildete Gammaridenauge. *Wisschaftliche Ergebnisse der Tiefsee-Expedition auf dem Dampfer 'Valdivia', 1898–1899* **20** (1): 1–84.

THORSTEINSON, E.D. 1941. New or noteworthy amphipods from the North Pacific coast. *University of Washington Publications in Oceanography* **4**: 50–96.

THURSTON, M.H. 1976. New pelagic amphipods (Crustacea: Amphipoda) collected on the SOND Cruise. *Journal of the Marine Biological Association of the United Kingdom* **56**: 143–59.

VADER, W. & ROMPPAINEN, K. 1985. Notes on Norwegian marine Amphipoda. 10. Scavengers and fish associates. *Fauna Norw.,* (ser. A) **3**: 3–8.

VERESHCHAKA, A.L. 1990. Vertical distribution of euphausiids, pelagic decapods and mysids in the near-bottom layer of the Western Indian Ocean. *Okeanologija* [*Oceanology (Moscow)*] **30** (1): 126–31. (In Russian).

VINOGRADOV, G.M. 1988. Life-forms of the pelagic amphipods. *Zoologicheskyi Zhurnal* **67** (12): 1765–75. (In Russian).

VINOGRADOV, G.M. 1990*a*. Amphipods in the thin near-bottom layer in the Southwestern part of the Indian Ocean. *Okeanologija* [*Oceanology (Moscow)*] **30** (1): 121–5. (In Russian).

VINOGRADOV, G.M. 1990*b*. Pelagic amphipods (Amphipoda, Crustacea) from the South-Eastern Pacific. *Trudy Instituta Okeanologii AN SSSR* [*Trans. P.P. Shirshov Inst. of Oceanology Ac. Sci. USSR*] **124**: 27–104. (In Russian).

VINOGRADOV, G.M. 1991. A new species of *Trischizostoma* (Amphipoda,Gammaridea) from the Indian Ocean (with the key). *Zoologicheskyi Zhurnal* **70** (6): 25–31 (in Russian).

VINOGRADOV, G.M. 1992. The probable ways of the Gammarides (Amphipoda: Crustacea) expansion into the pelagic domain: life-forms analysis. *Zhurnal Obshchei Biologii* [*J.General Biol. (Moscow)*] **53** (3): 328–39. (In Russian).

VINOGRADOV, G.M. 1993. Hyperiid amphipods from the Walters Shoal (southwestern Indian Ocean). *Arthropoda Selecta* **2** (1): 41–8.

VINOGRADOV, G.M. 1995. Colonization of pelagic and hydrothermal vent habitats by gammaridean amphipods: an attempt of reconstruction. *Polskie archiwum hydrobiologii* **42** (4): 417–30.

WALKER, A.O. 1896. On two new species of Amphipoda Gammarina. *Annals and Magazine of Natural History* (series 6) **17**: 343–6.

WALKER, A.O. 1904. Report on the Amphipoda collected by Professor Herdman, at Ceylon, in 1902. *Ceylon Pearl Oyster Fisheries – 1904. Suppl. Rep.* **17**: 229–300.

WALKER, A.O. 1909. Amphipoda Gammaridea from the Indian Ocean, British East Africa and the Red Sea. *Transactions of the Linnean Society of London* (series 2, Zoology) **12**: 323–44.